COAL AGE

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NO matter what our present station in life may be, we are all prone to believe that we are striving for one thing—self-satisfaction.

However, that is the one state of existence we must not enter. When we are pleased with ourselves, there we will abide. It is only when we are dissatisfied with what we are that we desire to attain to what we are not.

In all the world nothing stands still—we either advance or retreat. To stop is to go backward, and to be satisfied is to stop.

"Be content but not satisfied" is a wise injunction. A man may aspire and yet be quite content until it is time to rise.

We, ourselves, must be and do, and not rest satisfied merely with reading and meditating over what other men have been and done.

Satisfaction is conclusion. A man who is gratified with himself will achieve no more. It is a case of arrested development—stagnation has set in.

The men who have performed the buik of the world's work were always dissatisfied with anything short of an unattainable perfection. Contentment, therefore, with them was out of the question. They would not have been able to recognize it had it come their way.

Any man who is satisfied with his efforts to win success does not merit it. The wiser he is, the more clearly he knows how far his best falls below the best possible.

It is a lack of personal contentment that has made America great, while an excess of mental ease and self-satisfaction has made Spain humble. Her citizens are filled with self-approval, which leads to idleness, and an idle man is like a watch without hands—useless whether running or not.

True, there is some ambition which knows no gorge but the grave. It jumps at the stars, only to fall in the mud.

The man who would rise in the world must veil his ambition in the forms of humanity. He must not cut above his height, or he will get chips in his eye.

Nothing should be more humble than ambition when it is about to climb. And, when the topmost rung of the ladder is reached, we should not gaze off into the clouds and scorn to look again at the means whereby we did ascend.

It is also worth remembering that wealth is no more a crime than poverty is a virtue, and although we should prefer great principles to a great bank account, we need feel no shame in the possession of riches which come as an honest reward for toil.

Let us live in deeds, not years; in feelings, not figures on a calendar. 'Tis our actions, not our posterity, that will perpetuate our memory.

If contentment means absolute indifference, stupid slumber, or meek submission to circumstances, then no man has a right to be contented this side of death.

The Ethics of Organized Labor

EDITORIAL CORESPONDENCE

SYNOPSIS—A local press, subservient to the opinions of the mass of its readers, has greatly minimized what is developing into a serious situation in the anthracite fields. The labor organization, taking advantage of its irresponsibilities for its own acts, has consistently and repeatedly violated one of the basic principles of its agreement with the operators. Officials of the unions declare themselves powerless to control the situation; however, a suggested remedy is offered here.

Less than a year ago, a formal agreement was entered into between the anthracite operators and mine workers, binding employers and employees alike, for a period of four years. This was signed by ten coal-company officials and ten officers of the mine-workers organization, all duly authorized. It constitutes a binding agreement that should be scrupulously observed by every self-respecting employer and employee having the least conception of business ethics. In spite of this, the agreement has been violated, by the mine workers, openly, wilfully, knowingly and shamelessly, no less than 200 times, as reference to the files of the press will show.

In 1903, the Anthracite Coal Strike Commission, appointed by President Roosevelt, made an award in settlement of the great 1902 strike, containing the following excerpt:

IV. The Commission Adjudges and Awards—That any difficulty or disagreement arising under this award, either as to its interpretation or application, or in any way growing out of the relations of the employers and employed, which cannot be settled or adjusted by consultation between the superintendent or manager of the mine or mines, and the miner or miners directly interested, or is of a scope too large to be so settled or adjusted, shall be referred to a permanent joint committee, to be called a Board of Conciliation, to consist of six persons, appointed as hereinafter provided.

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The Board of Conciliation thus constituted, shall take up and consider any question referred to it as aforesaid, hearing both parties to the controversy, and such evidence as may be laid before it by either party; and any award made by a majority of such Board of Conciliation shall be final and binding on all parties.

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The membership of said Board shall at all times be kept complete, either the operators' or miners' organizations having the right, at any time when a controversy is not pending, to change their representation thereon.

At all hearings before said Board the parties may be represented by such person or persons as they may respectively select.

No suspension of work shall take place, by lockout or strike, pending the adjudication of any matter so taken up for adjustment.

The subsequent agreement, Apr. 29, 1909, provided as follows:

4th—Any dispute arising at a colliery under the terms of this agreement must first be taken up with the mine foreman and superintendent by the employee, or committee of employees directly interested, before it can be taken up with the Conciliation Board for final adjustment.

And the agreement of May 20, 1912, further provides:

(d) At each mine there shall be a grievance committee consisting of not more than three employees, and such committee shall under the terms of this agreement take up for adjustment with the proper officials of the company all grievances referred to them by employees who have first taken up said grievance with the foreman and failed to effect proper settlement of the same. It is also understood that the member of the Board of Conciliation elected by the Mine Workers' organization or his representative may meet with the mine committee and company officials in adjusting disputes. In the event of the mine committee failing to adjust with the company officials any grievance properly referred to them they may refer the grievance to the members of the Board of Conciliation in their district for adjustment, and in case of their failure to adjust the same they shall refer the grievance to the Board of Conciliation for final settlement, as provided in the Award of the Anthracite Coal Strike Commission and the agreements subsequent thereto, and whatever settlement is made shall date from the time the grievance is raised.

THE IRRESPONSIBILITY OF THE MINERS

These provide in a definite, fixed, unequivocal manner that: "No suspension of work shall take place, by lockout or strike, *pending* the adjudication of any matter so taken up for adjustment. Yet this latter clause has been violated wilfully, knowingly, even wantonly on no less than 200 occasions in the short space of ten months. Strikes have occurred weekly, and have been winked at, excused and even ordered by the union officials. They have also been condoned by the press of the country when such a flagrant violation of business ethics would have ordinarily resulted in the most bitter denunciation and an entire loss of prestige for the offender. The press may be able to justify its subserviency on the specious business reason—dictated by the circulation manager—that it must cater to the majority of its readers. With one eye upon the subscription list and an ear to the ground for the first sound of partisan disapproval from its interested and biased readers, it feebly reports the existence of another strike. If, perchance, it should express any opinion at all, it does not even straddle the fence but looks through a knot hole from the employees' side and explains away and condones the strike (a violation of a sacred agreement) by means of some absurd reasons advanced by the circulation manager. Perhaps a fair, unbiased, fearless press would have few readers. Possibly it might acquire many.

Why should these violations and strikes occur? Nearly every mine worker in the anthracite region is now a member of the union, and as such he is subject to its rules and regulations and represented by its officers. If, then, the miners violate an agreement entered into by their officers, they evidently do so with or without the consent of these officers. If with their consent, then the organization is guilty and irresponsible; if without it, then the union is irresponsible as to its obligations and agreements and its officers inefficient and incompetent. The miners' organization is not incorporated and cannot be sued. It is unwilling to incorporate so as to be, as the employers are, responsible legally as well as morally for its acts. An agreement between a body of incorporated, responsible employers with an army of unincorporated, irresponsible employees, must depend for its very existence upon the honor of the contracting parties.

The agreement of 1912 carries with it no penalties for violation. *Herein lies its fatal weakness!* Under the anthracite agreement there is no monetary penalty imposed upon either party for a violation. Here is the real cause of all the trouble, for obviously a law without a penalty is ineffective—a deadletter. Violations of many laws are punishable by fines; business agreements by forfeiture. Why not a penalty of fines in this case? Why not forfeiture in whole or in part of the benefits of this

agreement? If the labor leaders and officials were fair and sincere in the matter, they would discipline and punish members and groups of members who violate the agreement. Only by the strictest, almost military discipline can they hope to control the majority of the mine workers who make up their cosmopolitan army.

The anthracite agreement provides a means of adjustment for every possible dispute. There can be no dispute or action on the part of either party to justify a suspension of work upon any pretext. A walkout, concerted action in remaining away from work, or any other wilful suspension is a strike and a strike cannot occur without violation of the anthracite agreement. Yet there have been over two hundred!

A Remedy

In past agreements the operators have given an increase in wages or its equivalent. In return their employees agreed to do certain things. The employers have faithfully met every condition imposed upon them, while the employees have violated the agreement repeatedly and with no provocation whatever. If the operators ever again enter an agreement with the miners, they should demand a heavy bond to assure the latter acting in good faith. Or, if the agreement is violated by the employees, let there be a clause providing for an automatic suspension of certain conditions imposed upon the employers.

It is safe to say that if the last 10 per cent. increase in wages had been made contingent upon the employees living up to their agreement, there would not have been a single strike! To allay the fears that a strike might possibly be forced upon the men by unjust acts on the part of the operators, the Board of Conciliation, or the Umpire, could pass impartially upon the merits of such a case and the last vestige of an excuse for not accepting a penalizing clause disappears.

The bad faith, the lack of discipline, the failure to control its members, has placed the mine workers' officials in such a position that they are now technically obligated to call for a reassembling of the committee of twenty and offer to accept such a penalty for future violations. If they are acting in good faith, if they are sincere in their efforts to keep their agreement and maintain discipline in their organization they will suffer no unjust penalty and may still regain a reputation for business integrity which they do not now possess and without which they are a menace to society. In the name of industrial peace and business ethics, let the miners call for a reassembling of the committee.

National President John P. White, publicly and privately deprecates and denounces, but has not succeeded in preventing petty strikes. If he will advise, recommend and offer on behalf of his organization the enactment of an amendment or supplemental agreement along the lines suggested, he will insure the results he has, apparently, been so earnestly but futilly seeking. His sincerity is not in question, but his authority is. The business honor of his organization is at stake. It is badly shattered and likely to be lost. A practical solution is offered here and the miners' officials may some time be called upon to explain why they did not act upon it.

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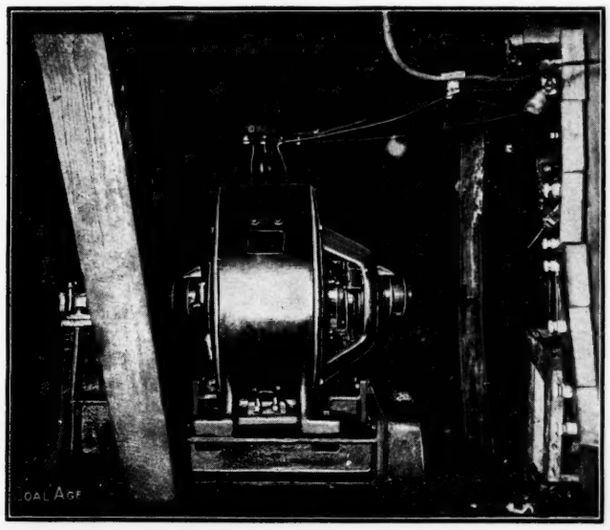
The English Rescue Apparatus Commission reached the conclusion that liquid air was unsuitable for use in mine-rescue apparatus, as it did not meet the demands made upon it when excessive exertion was necessary.

Self-Starting Direct-Current Motors for Driving Mine Pumps and Fans

The electric motor has proved so thoroughly satisfactory for driving mine pumps and fans that it seems almost impossible to improve it. It can be placed wherever a pump or a fan can be located; a couple of wires supply it with the requisite power; and when running it requires no attention whatever beyond occasional inspection and oiling. In fact, motors have proved themselves so useful and economical that they are rapidly displacing all other forms of power for fan and pump service wherever electricity is available.

An improvement has, however, been recently developed by the Westinghouse Electric & Manufacturing Co. which increases the value of these machines for mine work. This improvement consists in making the direct-current motor self-starting.



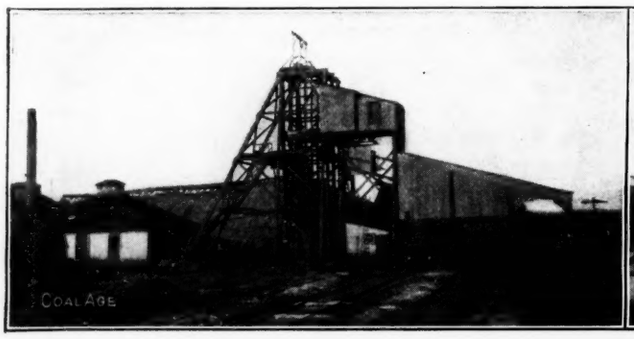
Self-Starting Motor in Place Underground

Heretofore, while it has been possible under some conditions to control them from the power house, most motors driving mine pumps and fans had to be started by hand. Hence, if the power went off temporarily for any reason, the motors stopped, necessitating an attendant going to each station to start them again.

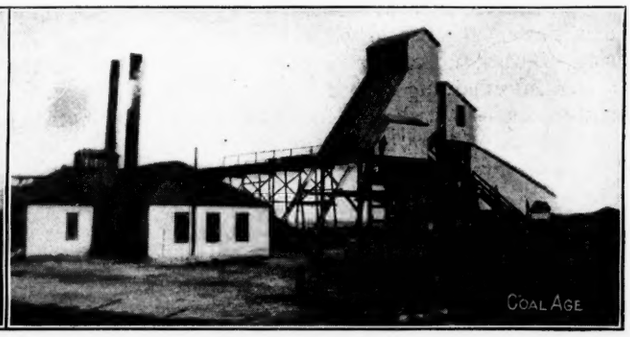
With the new self-starting machines, this inconvenience is done away with. When the power fails, the motors stop, it is true, but as soon as the power comes on again, they start automatically and settle down to work as though nothing had happened. Moreover, starting boxes are rendered unnecessary, and the wiring is of the simplest possible character. An occasional visit of inspection is all that is required by these motors. Otherwise they can be left entirely to themselves.

These motors have been thoroughly tried out in practical service and their advantages are commending them highly. Their electrical characteristics differ but little from those of the usual type, the only alteration being in the use of a heavier compounding winding, which reduces the flow of current when starting. Mechanically, there is no change. They are built in ratings up to 20 hp. for the voltages usually employed in mine work.

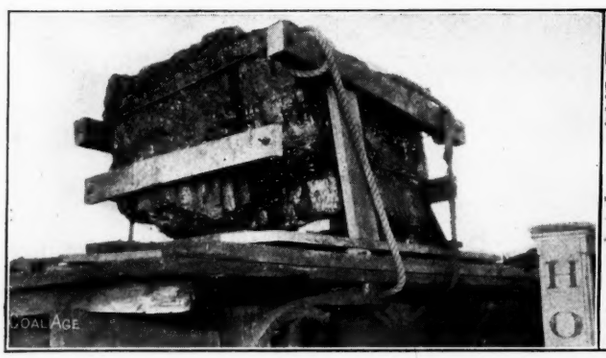
SNAP SHOTS IN COAL MINING



WESTERN COAL & MINING CO.'S NO. 15 TIPPLE AT FRANKLIN, KAN.

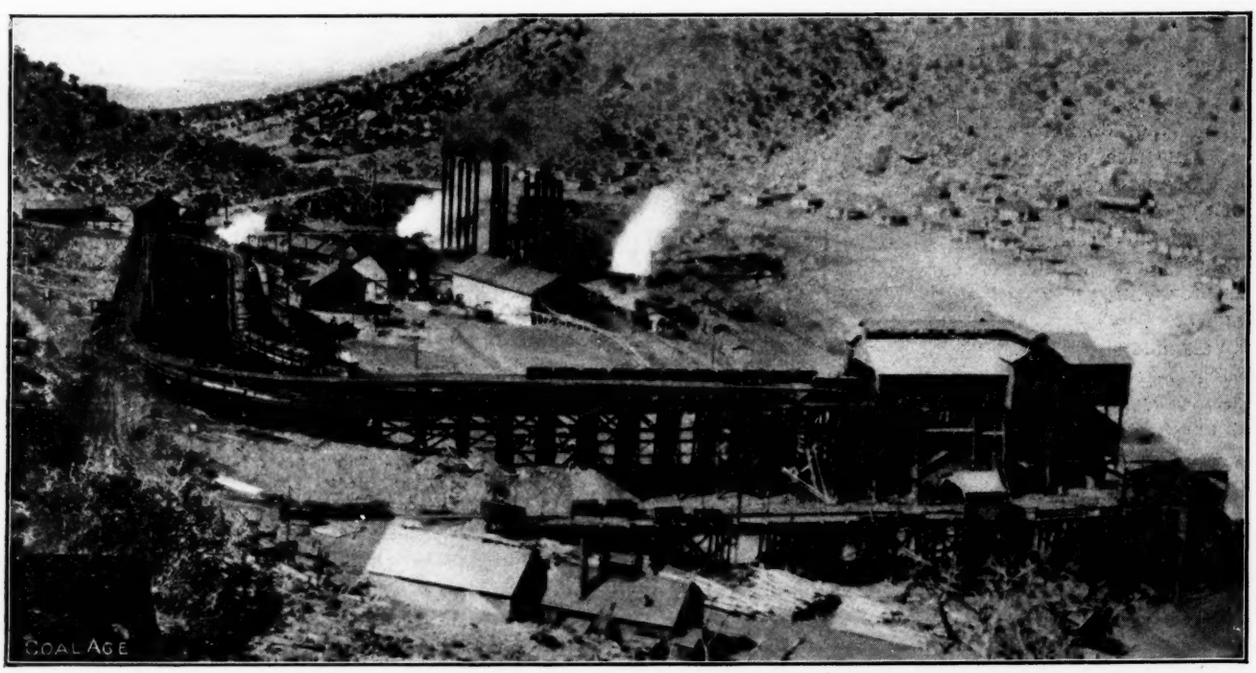


TIPPLE NO. 17 OF WESTERN COAL & MINING CO., AT MINDEN, MO.

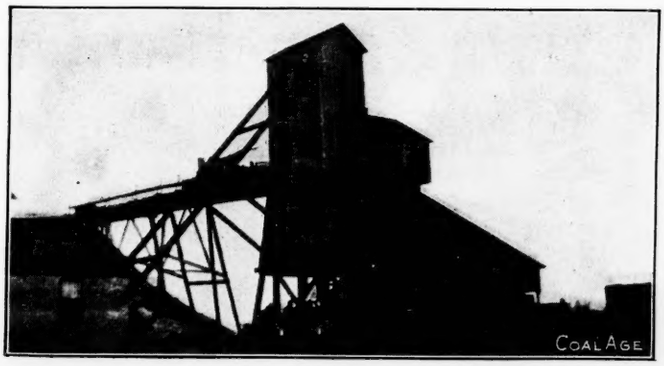


LUMP OF COAL TAKEN OUT OF MINE OF THE CANADA WEST COAL CO., TABER, ALBERTA, CAN. THE CHUNK WEIGHS 5965 LB., AND WAS EXHIBITED AT THE LETHBRIDGE FARMING CONGRESS

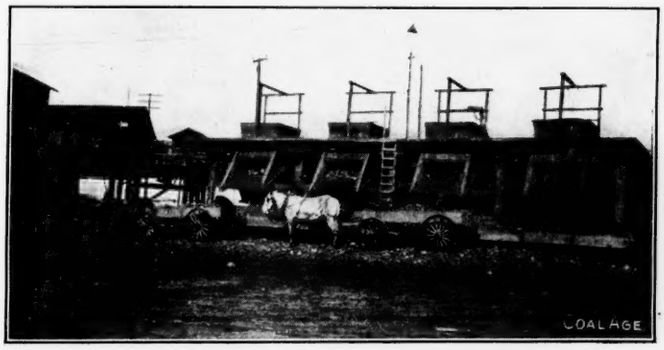
RESIDENCE OF GEN. MGR. SHOEMAKER OF THE VA.-LEE CO., ST. CHARLES, VA. THIS PHOTO WAS TAKEN AT MIDNIGHT BY MOONLIGHT; EXPOSURE, 35 MIN. NOTE LIGHT IN WINDOW



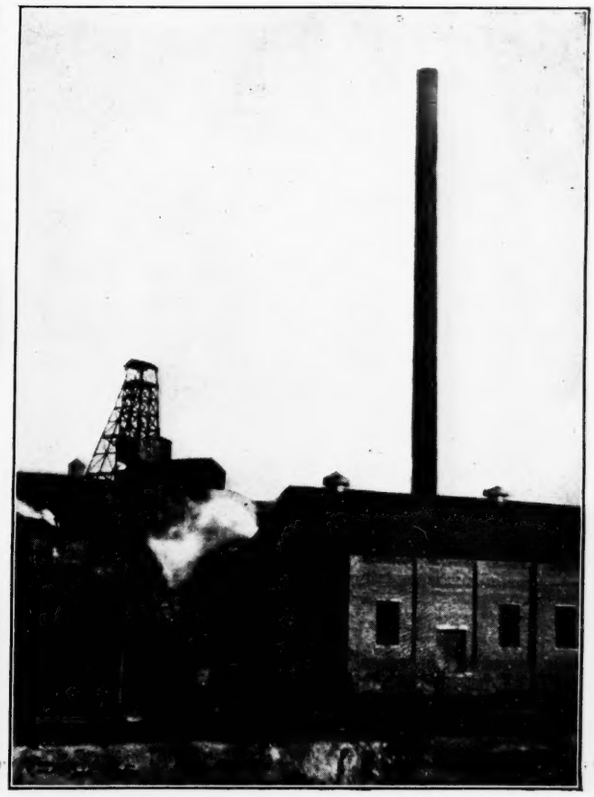
SUNNYSIDE MINE, UTAH FUEL CO. DAILY OUTPUT 2400 TONS. MOST OF WHICH IS CRUSHED COKE



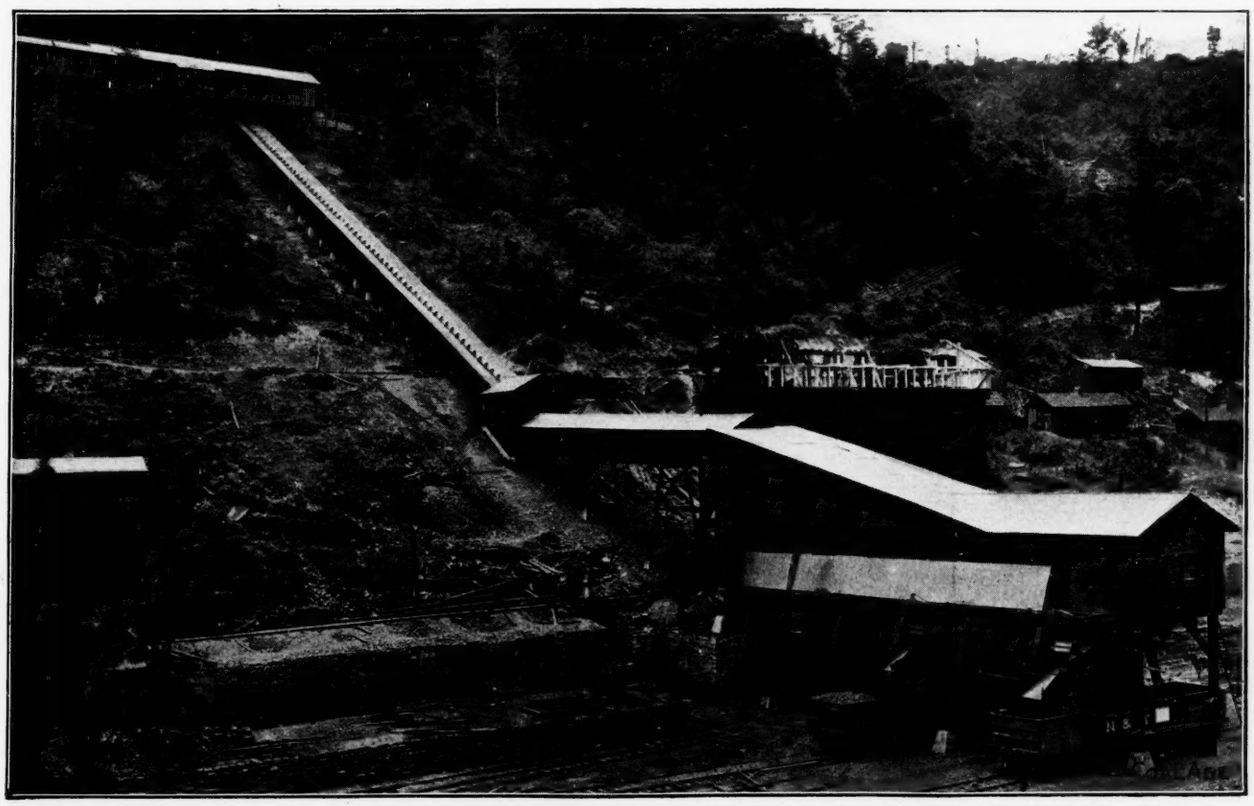
TIPPLE AT NO. 13 MINE, WESTERN COAL & MINING CO. YALE, KAN.



BAR-SCREEN CHUTES, NO. 9 MINE OF ST. BERNARD MINING CO., FURNISHES TOWN OF EARLINGTON, KY., WITH COAL



POWER HOUSE, TIPPLE AND HEADFRAME AT THE ALLISON PLANT OF THE W. J. RAINEY CO., ALLISON, PENN.



JEFFRY STEEL TIPPLE AND RETARDING CONVEYOR, ROANOAKE COAL & COKE CO., BEAR HOLLOW, W. VA.

Electric Motors for Driving Mine Pumps

By W. H. Easton

SYNOPSIS—In this article the advantages, relative economy and reliability of the electric pump are compared with those of the steam and compressed-air driven machines. The types of motors available for such work are also enumerated and their relative merits discussed.

It is safe to say that unless electric power had proven thoroughly satisfactory for driving pumps, it would not be enjoying its present extensive and increasing use in coal mines. In most mines pumping is essential for successful operation and no power could be used that did not adequately fill the requirements of mine-pump drive. But electricity is not only satisfactory for this purpose, but has also shown itself to be in general superior to either steam or compressed air.

Advantages of Electrically Driven Pumps

The advantages of the electric motor-driven pump can be summed up under (a) ease of installation and control, (b) reliability, and (c) economy. In all three of these points it is at least the equal, and for the most part the superior, of its competitors.

As to ease of installation, the unit formed by motor and pump is as compact and easily handled as the steam or air pump and can be placed wherever the others can be. It gets its power from wires, which are much more easily installed, altered and removed than are steam or air lines. There is no exhaust to consider, and the wires give off no heat as do steam pipes. It is therefore a comparatively simple matter to install an electric pump in the most out-of-the-way location, so that it is especially suitable for draining swamps. For the same reasons, motor drive is much the best for track and sinking pumps, the flexibility of the cables readily permitting the machine to follow the receding water level.

The adaptability of electricity is so great that the electric pump can be controlled in almost any desired manner. Many such machines are arranged to be started and stopped from the power house, even though they may be located miles away. Others are automatically started when the water level reaches a certain height and are stopped when the level is lowered to a predetermined point. The self-starting pump motor has been extensively employed of late. When one of these machines has been stopped because of a temporary failure of power, it will start automatically on the return of the current. This motor eliminates one of the principal objections to the electric pump, viz., that when no provision for remote control was made, a man had to visit each machine to start it after a shutdown of power.

In reliability the motor is at least the equal of either the steam or air engine. The modern motor is so designed that it requires practically no attendance beyond an occasional inspection and oiling. A properly installed pump motor will run continuously for many years with no renewals or repairs beyond a few extra brushes.

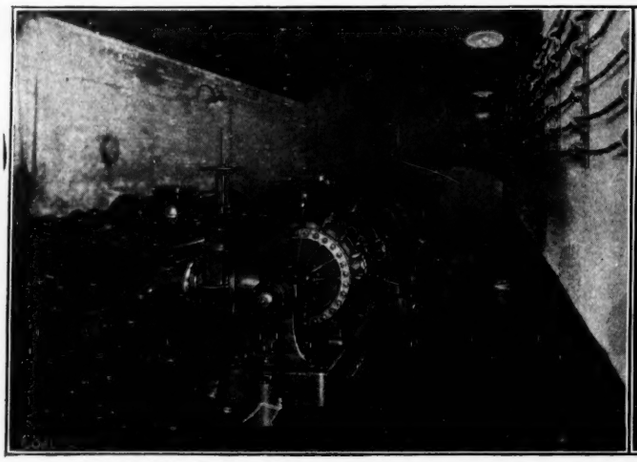
The Economy of Electric Pumps

In regard to economy the small steam pump is notoriously inefficient, whereas the small motor has a high efficiency. That is to say, it will take less coal to run a half dozen small electric pumps than to run the same number of steam-driven machines of similar capacity. In large sizes, the economy of the steam pumping engine is greatly improved, but the motor keeps pace with it and is at least as good.

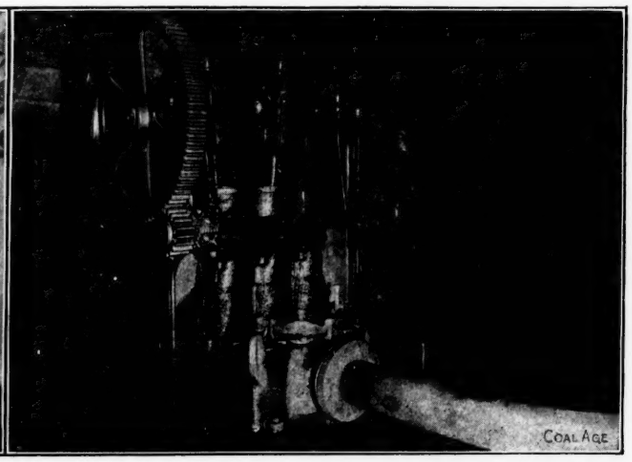
Air pumps are extremely uneconomical. In one installation in the central Pennsylvania bituminous field, it required 11 boiler-horsepower to obtain 1 water-horsepower from large air-driven pumps emptying a sump. Electric motors were substituted for the engines and it then required about 2 boiler-horsepower for the 1 water-horsepower. Since the load was large and continuous this increase in efficiency meant a great saving in the course of a year.

The efficiency with which electric power can be transmitted over great distances is of special importance in coal mining. The loss in electric wires is comparatively small, while the losses due to leakage of air or steam or the condensing of steam are always large and often prohibitive, especially in long lines.

For the most part, direct-current motors are used in



Centrifugal Pumps Underground



A Westinghouse Motor Driving a Plunger Pump

coal mines, it being the best for haulage. Alternating machines are, however, used in many instances, and motors of either kind can be obtained for driving any size or type of pump.

In applying direct-current motors to centrifugal pumps, and to reciprocating pumps starting with a by-pass, shunt field windings will usually be found most suitable. Such motors have better speed regulation than compound-wound machines, and will start under considerably more than full load.

For reciprocating pumps starting under full head, or where heavy initial effort is required, the compound-wound motor will prove more suitable, owing to its ability to exert greater power during the starting period.

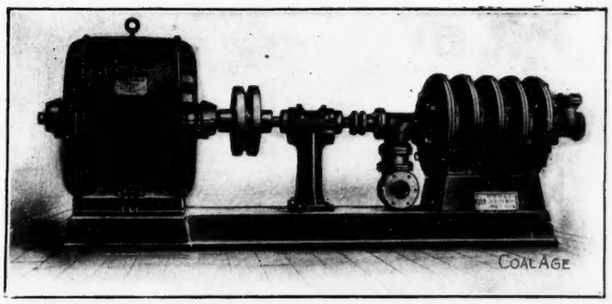
The Two Types of Motors

There are two types of alternating-current induction motors in general use, viz., squirrel-cage and wound-rotor machines. The squirrel-cage type of motor is the simpler

A Vertical Centrifugal Pump

and less expensive of the two designs. It is also easier to start and control. It is undoubtedly the most suitable and popular alternating-current motor for centrifugal pumps and is at the same time the one most advantageously employed for piston or plunger pumps which may be started with a by-pass; but if any such reciprocating machine must be set in motion against the full static head, more starting effort is needed and a wound-rotor motor will better fill the requirements.

After either a squirrel-cage or wound-rotor motor has been brought up to speed, there is no difference in operation; they will have approximately the same efficiencies, power factors and overload capacities and will also have the same speed regulation between no load and full load.



A Motor-Driven Multi-Stage Centrifugal Pump

Both types are essentially constant-speed machines, but if furnished with a special controller the wound-rotor motor may be used for variable-speed operation with a sacrifice in efficiency and regulation at reduced speeds.

The ordinary horizontal shaft motor is used for driving reciprocating and horizontal centrifugal pumps; for vertical centrifugals, a vertical shaft motor, which can be coupled directly to the pump shaft, is used.

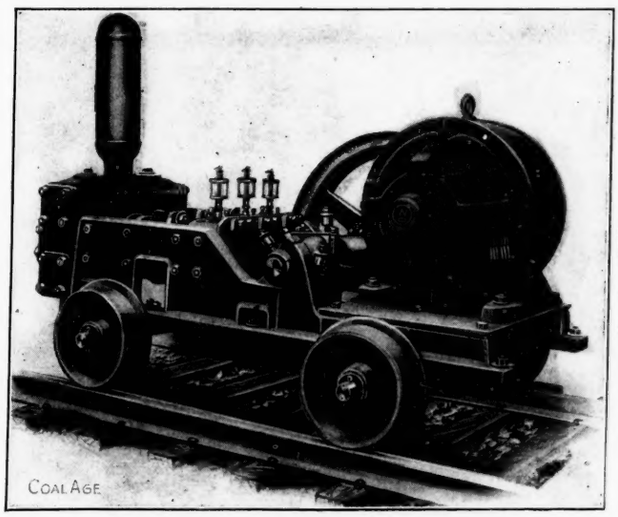
Special Machines Are Necessary

The conditions in coal mines are unusually severe on electrical machinery, so that a motor that would give perfect satisfaction in a factory would be out of commission in a short time in a mine. Hence motors especially constructed to meet the conditions should be used in underground installations.

Moisture-proof windings are of special importance. The insulation of the ordinary motor would soon become saturated with moisture in a mine and cause trouble, hence some manufacturers supply machines with specially treated windings which resist dampness indefinitely. Where the motor is subjected to drip, it should be protected by shields or inclosed in water-tight covers.

Motors are sometimes made for total immersion. One of the simplest methods is to place the machine in a kind of diving bell, closed above and open below; the air in the upper part of the bell keeps the water from contact with the motor even though the level should rise high enough to submerge the whole outfit.

Good commutation is especially desirable in mine-pump motors. Sparking at the commutator wears away both it



Westinghouse Motor Driving a Track Pump

and the brushes and makes renewals necessary. But by using commutating poles and designing the motor carefully, all sparking can be eliminated, so that the commutator's life is indefinite, brush renewals are rarely required, and the reliability of the motor is greatly increased.

Direct-current self-starting motors, previously mentioned, form a special class. Ordinary motors are sometimes used for this purpose but it is not considered good practice, as the stresses arising in starting a motor, not specially designed, without the interposition of a starting box, are quite severe and are sure to cause deterioration. In the self-starting type of machine, special coils are provided which keep within safe limits the rush of current at starting; such a motor will, therefore, not only give better service, but will cost less to operate than the non-special machine. These direct-current motors are built in capacities up to 20 hp. Almost any good alternating-current, squirrel-cage induction motor up to 20 hp. in capacity or even larger can be started directly from the line without injury.

Auxiliaries Should Be Specially Constructed

When a starting box is used in connection with a motor, it should also be of special design in order to withstand dampness. One manufacturer supplies a box in which the low-voltage release coil is made moisture proof and the resistance is embedded in a moisture-proof cement. This construction prevents the corrosion and deterioration that is apt to take place in unprotected apparatus.

In ordering an electric pump it is always advisable to specify a motor made by a reputable firm with extensive experience in mine work. Such a motor may cost a trifle more than one of inferior make, but will more than make up the difference by the better service it will give. Similarly, in buying motors to drive pumps already installed, it is advisable to consult such a manufacturer; the characteristics of different pumps and the requirements of different services vary so greatly that only an expert is qualified to select the proper motor for any given case, and if a wrong selection is made, trouble may result.

In order to secure the advantages of electric pumping it is not now always necessary for the mine to install its own electric plant. In many parts of the country central-station power is being used for driving part or all of the mine machinery. Where such power is available, it will nearly always pay to install electric pumps and in many cases the entire mine can be economically operated in this manner. At all events, the subject should be investigated carefully as an increasing number of mines are finding it profitable to buy their power.

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A Pump for Breaker Refuse Disposal

Special Correspondence

SYNOPSIS—A vertical, triplex, single-acting, cement-lined, motor-driven, plunger pump has been installed recently at an anthracite breaker to replace a bucket elevator and sluice system of refuse disposal. So far as can be judged at present, this machine will cut the cost of getting rid of the slush from the breaker to about one-half its former magnitude.

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The disposal of refuse and unmarketable sizes of coal from anthracite breakers is frequently a somewhat perplexing problem. If flushed into streams or rivers, as was once the custom, it soon fills up and clogs the channel, causing complications in time of high water, for which no mining company would care to be held responsible.

There are in general three methods of disposal for such refuse. (a) It may be flushed or otherwise stowed in the old workings of the mine. (b) It may be heaped or piled by cars or conveyors at some point close to the breaker, or (c) it may be flushed or conveyed to some point more or less remote from the breaker and where its likelihood of being washed into the neighboring larger water courses is reduced to a minimum.

The method to be employed in any particular case will be determined either wholly or in part by the location of the breaker and the topography of its immediate surroundings, as well as the conditions underground.

For several years past the practice at a certain anthracite colliery has been to dispose of the breaker refuse by elevating and flushing to a location considerably above the point of preparation, where it was allowed to settle and drain off in a depression beyond the first ridge in rear of the breaker.

This was accomplished by means of a system of bucket elevators discharging into sluices. And, altogether this method was efficacious, so far as the refuse disposal was concerned, it was decidedly unsatisfactory, both from a power-consuming and an operating standpoint.

Recently, therefore, a special slush pump and pipeline has been installed which does the work of the former system, occupies much less space and has thus far been vastly more satisfactory in operation.

The water carrying the refuse from the breaker passes through a steel plate filled with $\frac{7}{16}$-in. circular perforations into a vat or tank. What particles of slate, etc., remain on the screen are removed and disposed of by hauling away. From this tank the water passes to the suction of the pump and since the latter is considerably below the level of the water in the tank, it is provided with an air chamber.

The pump which has a capacity of 1000 gal. per min., is of the vertical-triplex variety driven by a 50-hp. open type slip-ring induction motor operating upon a 440-volt 25-cycle 3-phase circuit. The full load speed of the motor is 360 r.p.m., while the speed reduction, which is accomplished by means of a cut-steel herringbone gear meshing with a forged-steel pinion is in the ratio of 12½ to 1, making the full-load speed of the pump 29 r.p.m.

Bronze plungers 14 in. in diameter with a 16-in. stroke are employed. These are, of course, outside packed. The cylinders, valve chests and all parts of the piping are cement lined to resist the action of the acid and also the abrasion of the gritty slush.

The valves of this pump are unique. They consist of 5½-in. bronze balls operating within a cage, which is also of bronze, upon 3½-in. ports. The spherical form

of the valve renders it far less liable to uneven wear than were it flat while its composition possesses strong capacity for resisting corrosion.

A bypass is provided from the discharge to the suction pipe and drain cocks are so located as to thoroughly rid the pump and pipeline of all water. The apparatus must be thus drained not only to prevent freezing in cold weather but to rid the pump and discharge pipe of all slush when no water is flowing, as otherwise this material would settle in a compact mass effectually clogging the pipe. Relief valves are also provided in case of any contingency.

The liquid handled contains from 30 to 50 per cent. of solid matter by weight, as well as about $\frac{1}{10}$ of 1 per cent. of sulphuric acid. This is delivered against an actual vertical head of 109 ft. through an extra heavy cast-iron pipeline 12 in. in diameter and about 500 ft. long. The actual pressure against which the pump works, due to the increased weight and resistance of the liquid in the pipeline, is 65 lb. This, of course, includes the friction.

The power required to handle this slush is approximately 63 amp. at 440-volts tension. When pumping clean water, the current required at the same voltage was only 45 amp. The motor is mounted on top of the pump frame, where it takes up no floor space and requires no guarding of gears.

As stated above the slush was formerly disposed of by means of elevator towers and sluices. For some time before the installation of the pump, the operation, maintenance and repairs on this system cost approximately $600 per month. As nearly as can be foretold at the present time, the pump attendance, maintenance, power and repairs, in short, all items of expense connected with this latter system, will be approximately $300. The installation of this equipment has, therefore, cut the expense entailed in the disposal of slush at this colliery exactly in half.

Small Pumps for Hard Service

SPECIAL CORRESPONDENCE

The lover of horses is prone to discourse enthusiastically upon the speed, endurance or beauty of the genus equus, forgetting meanwhile the draft animal, which is the real servant of man, bearing his burdens, transporting his goods, drawing his agricultural implements; in short, performing much of the work and drudgery which renders our modern civilization possible.

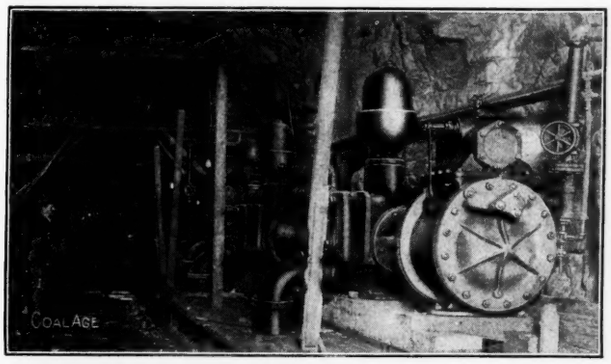
In like manner the operator or engineer familiar with mine drainage and the problems incident thereto, will persistently speak only of those pumps which have been purchased and installed to perform some special service, or those which occupy some conspicuous position, forgetting utterly the machines which are scattered about through the workings, each doing its share, even though that share be but small, toward enabling the underground worker to perform day by day his allotted task and thus securing to the mine its rated output.

The capacity of such pumps is not ordinarily great. The conditions under which they are called upon to work are usually far from advantageous. The fluid which they must handle is frequently aciduous and often carries more or less solid matter and grit in suspension.

Any pump which can successfully meet and cope with these conditions must be simple in design, constructed of the best materials, sufficiently heavy to withstand not only a considerable amount of abuse, neglect and rough handling, but also to retain a large percentage of its original efficiency over long periods of hard and continuous service. But above all other things, such a machine must be first, last and always absolutely dependable.

The A. S. Cameron Steam Pump Works have long produced machines to meet the exacting conditions of mining work. From the mechanical standpoint the most interesting feature of these pumps is the steam-valve mechanism. This is entirely inclosed and is in no way dependent upon the movement of any exterior cams, levers or contacts. The piston near the end of its stroke operates a small auxiliary or pilot valve which, through the action of the steam, causes the main valve to shift, thus reversing the direction of travel of the plunger. The advantages of this inclosed valve mechanism for use underground are too self-evident to require comment.

Another distinctive feature of this pump is the easy access to the water chamber. By merely removing the side cover or bonnet, the valves, guards, seats, stems and springs are in plain sight. This is an advantage that is much appreciated by the experienced engineer or pumpman.



A REMOTE UNDERGROUND PUMPING STATION. THREE DUPLICATE MACHINES

It should also be noted that these parts are made heavier than those found in the average pump. There are no threads on the seats or stems, which project through the top of the water-valve chest, these being made fast by a cap nut and setscrew on the outside.

All the rubber valves in these pumps above the size 7x3½x12 in. are covered with heavy cast-brass cap plates, or guards, which are finished inside and permit the valve to fit snug. This preserves the upper side of the valve for use when the underside becomes worn.

Another special advantage in this valve-chest construction is that it is close to the ground and alongside the water piston instead of above the water cylinder as in some other makes. The valves are therefore just so much nearer the water and the suction lift is reduced accordingly. Furthermore, every water cylinder is made to withstand a pressure equivalent to a 400-ft. head.

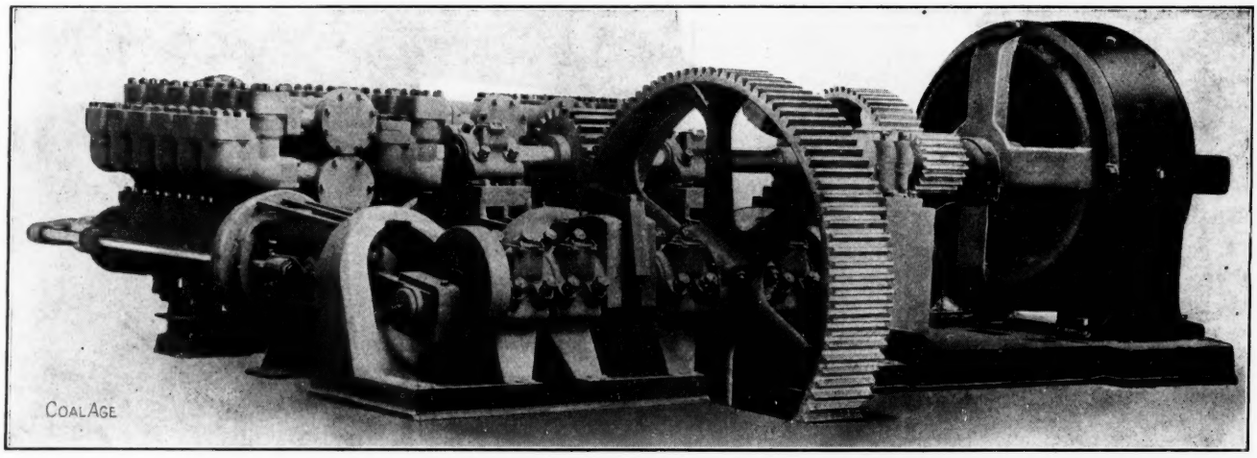
These distinctive features make the Cameron pump unusually strong and reliable throughout, which accounts in large measure at least for its remarkable record of long and severe service in coal mines all over the world.

The Advantages of Electric Pumps

By J. W. Matthews

SYNOPSIS—The electric system of power distribution is much more flexible than either steam or compressed air and electrically driven pumps are more efficient than those employing either of the above mentioned working fluids. There are other advantages also, such as portability and the space required, to say nothing of air vitiation or dry rot in mine timbers.

Electric pumps are now sold under guarantee to operate under water if flooded. They have been flooded by water at 165 deg. F. for twenty-four hours and have come out unhurt, have pumped themselves dry when flooded even after weeks of submersion, and have stood up under the attack of sulphuretted hydrogen for years in locations where attendants could not endure the gas. Add to this brief review a statement that the operating cost of electric pumps is generally less than that of any other power-driven pump, the efficiency frequently 20 to 40 per cent. greater than steam- or air-operated machines, and the reliability of operation supreme and some idea can be gained of the reasons which have caused widespread interest and adoption of electricity as a motive power for mine pumping.



A Horizontal Plunger Pump, Driven by a G. E. Motor through Double-Reduction Spur Gearing

Any statement of the principal advantages of electric power for mine pumps should include the general advantages of electricity as a motive power for mines, which also applies to the pumping-power system as a whole. A brief review of these, with a few remarks on the selection and application of motors followed by the experiences of some operators with electric pumps will be interesting.

Advantages of Electric Power

One power plant can be used instead of several. This means greater efficiency because of larger average load, larger size and less attendance and supervising. To assure continuity of operation, a smaller margin of reserve apparatus is necessary than the total provided at the several small plants.

The central station can be located solely with reference to the generation of power, the supply of boiler and condensing water, the handling of fuel and disposal of waste, etc., practically regardless of the relative location of the various points at which the power is to be applied.

The use of electricity eliminates the necessity for long lines of steam and air piping which are expensive to install and maintain and with which the danger of breakdown and the difficulty of obtaining the necessary working pressures increase with every extension of the service. For these conditions electricity substitutes a simple and thoroughly flexible system of transmitting power by means of conductors, which can be easily run and rapidly extended to meet changes involved in the progress of development, which are not affected by temperature variation and are not liable to mechanical injury or breakage due to floods or shifting ground.

They can be safely used in places where steam lines would introduce an element of danger, and finally they can, in many instances, be run in shafts or bore holes already in use for other purposes without occupying room that could otherwise be utilized. Many coal companies are at present economically transmitting or distributing current from central stations over lines more than 10 miles long and in some cases twice that distance.

A large percentage of the friction losses and repair charges can be eliminated by directly connecting the motor to the pump, as the modern types of both alternating- and direct-current motors lend themselves to this method of connection in the majority of cases with the assistance of a single gear reduction.

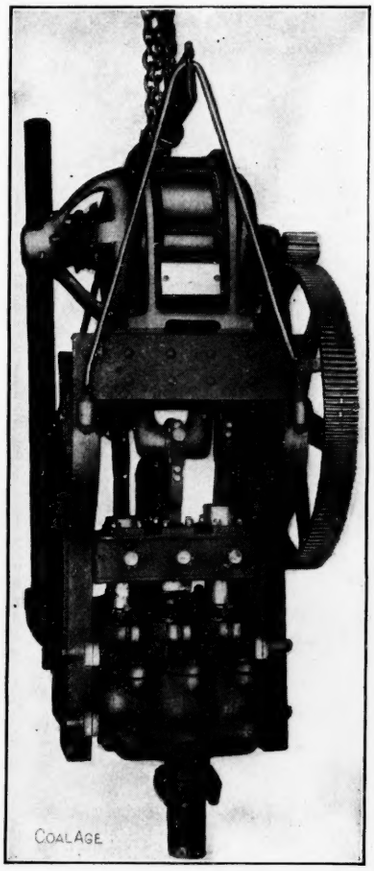
With electric power only a small part of the generating plant need be operated during a shutdown for the pumps, ventilating fans, etc., which must be kept in operation. This intelligent subdivision of the total power-generating equipment into units which can be operated at or near their full capacity during anticipated mining conditions, is a valuable intrinsic feature of electric power.

Electric Machines Have Higher Efficiencies

The efficiencies of electric pumps are 25 to 40 per cent. greater than steam or air, the centrifugal pumps in one case operating at 61 per cent. or 5.6 lb. of coal per i.hp.-hr., and in some cases efficiencies as high as 80 per cent.

are claimed for these machines. A few extreme examples of the extravagance of air pumps which have an efficiency of only about 15% under quite favorable conditions are known.

Steam pumps, of the compound condensing type, 20 and 38x13x36 in., require 10 lb. of coal per i.hp.-hr., including boiler loss, condensation, etc. Where air pressure must be maintained outside of working hours, the efficiency of air pumps may be as low as 1 per cent.



A Motor-Driven Sinking Pump

The meters used in electric circuits show at a glance any abnormal operating conditions, and efficiency can therefore be maintained at all times and there is no possibility of undetected leaks as in the case of steam or air.

Economies in operating cost and maintenance greater by 15 to 40 per cent. are claimed for electric pumps over steam or air. In the case of the latter, pipes are not as quickly repaired as wires and the many joints are hard to keep tight.

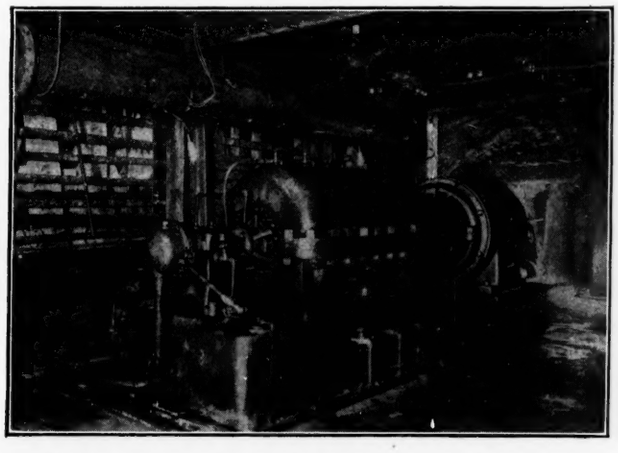
Electric pumps occupy from a fourth to a half less space than steam or air pumps, are easily moved and quickly put into operation without loss of time, can be controlled from a distance and can be arranged to maintain high pumping efficiency under widely varying loads.

Electric pumps are desirable in many cases because they do not vitiate the air nor cause dry rot in mine timbering, as is the case with steam, which also warms the water in sumps, so that its value for condensing purposes is lessened.

Both high- and low-lift centrifugal pumps, three-throw pumps, and special positive-valve pumps have been driven successfully with electric motors.

Electric track pumps can be moved with the greatest ease and can be operated from the nearest trolley or lighting circuit available. They are usually driven with a double-gear reduction, which can be made practically noiseless with cloth pinions.

Either compound- or shunt-wound direct-current or slip-ring or squirrel-cage alternating-current induction motors are suitable for the operation of pumps. Where varying voltage is encountered a compound-wound motor is better adapted to pump operation than the shunt machine. The shunt motors are satisfactory where a little increase in speed, due to their field heating up, is not objectionable, but the induction motor is most highly recommended because there is no electrical connection between its operating and stationary parts which, together with its insulation, renders it waterproof. Beside this its speed is constant and its efficiency high. These motors can be controlled from any convenient point, as by a float in the sump for automatic starting and stopping. They can also be controlled from a distant point, which may be miles away, and stopped or started by simply pressing a button.



A Horizontally Split Motor-Driven Centrifugal Pump

The weight of the water pumped, multiplied by the height plus the loss in head due to pipe friction, divided by 33,000, should be divided by the efficiency of the pump to get the horsepower of the motor required. Excess power is needed for starting a column of water and for overcoming silt or sand in the intake pipes, but all liberally designed motors will take care of this.

When operating a number of alternating-current motor-driven pumps from one generating station, they should be kept well loaded or it may be necessary to install synchronous motors or rotary converters to improve the power factor.

The power factor is the ratio of the useful power in watts to the product of volts and amperes. The difference is lost in magnetising current and in charging conductors, but must be generated as well as the useful power. Fortunately this is very low, say 5 or 10 per cent. of the generated power, on a well loaded system, and is more than made up by the great economies in transmitting electric current and its possibilities for direct applica-

tion without countershafts or belts for mine machinery. The power factor can be better understood by considering a few examples of electric equipment.

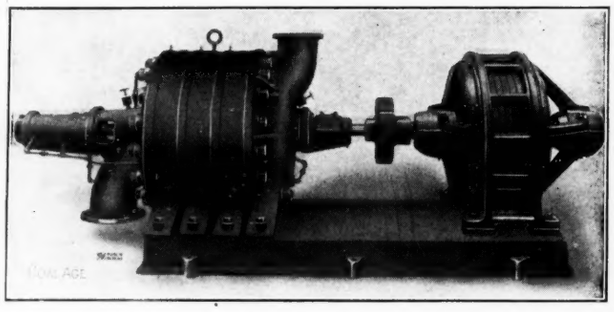
Some Examples of Electric Installations

At the Windber plant of the Berwind-White Coal Mining Co. there were installed seven 400- and two 150-kw. rotary converters, three 300- and two 225-hp. synchronous motors, totaling over 4000 kw. in synchronous apparatus. The inductive apparatus includes, in addition to 300 kw. in transformers, about 3000 hp. in induction motors. The power factor on the system is usually just at unity, that is, there is no so called useless power.

At the York Run plant of the H. C. Frick Coke Co., the synchronous load connected is 1200 kw., all rotary converters, while the inductive apparatus amounted to 2200 kw., consisting of 1350 kw. in transformers for the rotaries and the balance in induction motors from 50 to 400 hp. The induction motors are fairly well loaded and the power factor is over 90 per cent.

To illustrate the waterproof qualities of squirrel-cage induction motors, two examples will be instructive.

During a heavy thaw a 20-hp. induction motor, driving a mine pump at the bottom of a shaft at the mines of the Richmond Iron Works, was flooded, the top of the motor being two feet under water. The machine continued in operation and at the end of two hours had pumped itself clear. It was then stopped, cleaned and oiled



A Vertically-Split Centrifugal Pump Direct-Connected to Motor

and put into service again. This pump has been operating about twenty hours a day ever since and has apparently suffered no injury.

The most remarkable motor-driven pumps in existence are probably those at the Comstock mines, where, during a changeover, water at 165 deg. F. submerged the pumps for twenty-four hours. The motors were dried out with voltages of 38, 110 and 440 and in a few hours were put to work. Although the motors were not damaged, a telephone receiver was melted out of shape and warts were raised upon it.

Whenever the air supply is insufficient the contractors on the Catskill Aqueduct stop the air pumps and rely entirely on the electric pumps. This is done where the compressor capacity makes it advisable to use the air pumps when demands are light, but wherever possible the air pumps are removed and electric ones substituted. In one case three air-driven pumps were displaced at the Hudson River Siphon by one 500-gal. per min. (1200-ft. head) centrifugal pump, driven by a 275-hp. ball-bearing water- and air-cooled squirrel-cage induction motor. This motor can be turned over with the little finger when disconnected from the pump and the air cooling has never been necessary.

Part of the government's test for the new dry-dock pumps recently purchased was to submerge the motors for three weeks and then turn on the current until they had pumped themselves dry. The water was 30 ft. deep in a well at the drydock, and was, I believe, sea water.

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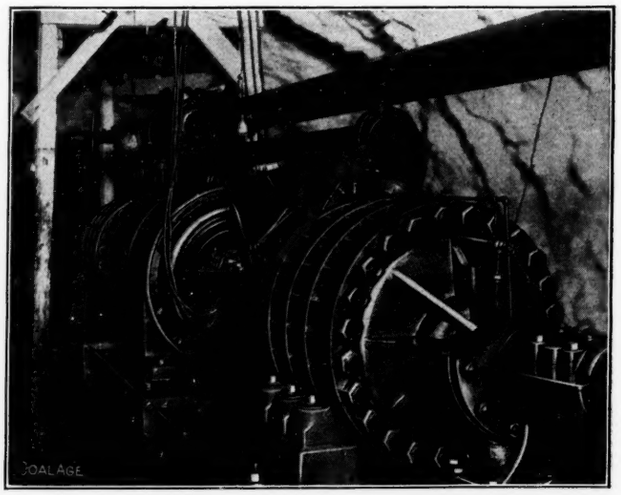
A High Head Centrifugal Pump

Although many centrifugal pumps may be found in coal mines throughout the country, the vast majority of them operate against heads considerably below 1000 ft. Several installations exist, however, wherein this head is greatly exceeded. The Prescott turbine pump shown in the accompanying illustration and located in the Penn Iron Mining Co.'s mine at Vulcan, Mich., is an 8-in. 8-stage, composed of two 4-stage machines operated in series, one located on either side of a 500-hp., 2200-volt, 60-cycle, 3-phase induction motor, operating at 1200 r.p.m.



An Eight-Stage Centrifugal Pump Working under a 1300-Ft. Head

The shafts of the pumps are direct-connected to the motor shaft by compression couplings. The discharge from the first half is carried around the motor to the suction of the second half. The direction of flow of the water in the two parts of the pump being thus opposed tends to balance the end thrust on the impeller shaft. In addition to this, however, there is furnished a disk thrust bearing with oil cushions which completely takes up the thrust and maintains the impellers in their proper positions with respect to the diffusion vanes and prevents excessive wear on one side. As may be seen in the photograph, the discharge heads and pressure rings are of cast steel, split vertically and held in position by heavy external through bolts. The impellers and diffusion vanes are of cast bronze. The bearings are of the ring-oiling type and separate from the pump casings. The pumps and motor are mounted on and securely bolted to the cast-iron bedplate extending under the entire unit.

This machine delivers 1000 gallons per minute against a vertical head of 1300 ft. and has been in continuous and successful operation for over two years.

The Evolution of the Mine Pump

By Frank H. Kneeland

SYNOPSIS—Like most other pieces of mechanism employed in present-day arts and industries, the modern mine pump is the outcome of a gradual development. The early stages of its growth are linked inseparably with the names of such inventors as Worcester, Savery, Newcomen and Watt. However, during the past century, many other men have introduced various alterations and refinements.

Neglecting the experiments of Hiero, of Alexandria, who lived and flourished about the year 200 B.C., the real history of the steam engine and pump began with Edward Somerset, second Marquis of Worcester, about the year 1663. This inventor designed and built a device somewhat similar in principle to the present-day pulsometer, lacking, however, the latter's automatic-valve feature.

That the pump should be the first successful heat engine developed and that it should find its primary application in ridding mines of water is not strange. Great difficulty had been experienced in satisfactorily draining British mines, particularly those of Cornwall, and the operators were, therefore, extremely anxious to make use of any device for lifting the water which might prove more economical than the horses then employed.

It is a strange but notable fact that many, if not most of the real improvements in coal mining, have come from men who were not themselves practical miners. The mine pump was no exception to this rule.

The First Steam-Driven Pump

The first steam-driven water-lifting machine to be successfully employed in mining was what was known as Savery's "fire engine." This was not altogether dissimilar to the Marquis of Worcester's device in principle. The main difference was that surface condensation was employed to hasten the insuck of water to the operating vessel. A safety valve was also employed as was a second or auxiliary boiler to force water into the main or working boiler without interfering with its operation.

The next great forward step in pump development was the invention of the famous Newcomen engine. In this machine a heavy vertical pump rod was attached by a chain to one end of a walking beam provided with a quadrant. To the other end of this beam, also provided with a quadrant, was similarly fastened the piston, which worked vertically in a cylinder. Steam was led from the boiler to the cylinder equalizing the pressure of the air and allowing the heavy pump rod to fall, thus raising the piston. The steam supply was then cut off and a jet of cold water introduced into the cylinder. This condensed the steam beneath the piston, which descended under the pressure of the air, thus raising the pump rod.

Several improvements in this device were introduced from time to time, chief among which was an automatic valve gear, a fairly efficient method of packing the piston with leather or rope and its lubrication with tallow.

This machine was received with considerable favor throughout the mining districts. From about 1758 until the introduction of the engines of Watt, the Newcomen pump was the standard, and all but universal means of raising water from the mines. Some of these machines have been in use up to the present day.

The next improvement of the pumping engine came from James Watt, who added, first the separate condenser and later other improvements. This inventor also built the first successful rotary-motion engine or machine suitable for driving industrial plants.

The coal-producing industry as an industry is perhaps rather conservative. The operator finds it difficult to discard any piece of machinery that is in even fair working order and pay out good cash for new apparatus even though he is convinced that money would be saved thereby in the long run. Just as the older mining companies in the United States are clinging tenaciously to distribution of power by means of extravagant steam lines, so the English have stuck to walking-beam and bell-crank pumps with their long and heavy wooden pump rods.

Of course, these machines have their advantages and may be so constructed as to be economical in their use of steam. They are, however, extremely heavy for their power, clumsy, and require a special shaft or compartment within which the pump rods oscillate.

The direct-acting piston or outside packed plunger pump, either simplex or duplex, simple, compound or triple-expansion, has always been a great favorite in this country. And although some economical flywheel machines are in use at American collieries and have been for some years past, yet the great majority of our pumps, those which handle by far the largest percentage of the mine water encountered, are of the direct-acting type.

With the electrification of mines and the adoption of this form of energy, for various mining problems, has come the duplex, triplex and quintuplex electrically driven, geared pumps. These are frequently small machines, capable of being mounted upon a truck which can be run along any mine track, to be used wherever a dip or swamp is encountered.

The Centrifugal Pump Is a Favorite with Many

In comparatively recent years also another type of pump, known as the centrifugal, has been developed. This is as radically different from the older varieties as is a steam turbine from a reciprocating engine. Although the centrifugal pump is not popular for use underground with some operators, it is a great favorite with others. Its utility for this service seems to depend largely upon the size and shape of the impeller passages and the quantity and size of the pieces of foreign matter (chips, coal, rocks, etc.) suspended in or otherwise carried by the water. It cannot be wood lined and thus proofed against the action of acid, as may be the plunger pump. All parts subject to the action of the water may, however, be made of bronze, the corrosion resisting qualities of which are well known.

The great simplicity, light weight, large capacity and ease with which this type of pump may be connected to a motor or other driving apparatus, as well as a total lack of vibration or water hammer on the connected pipeline, due to the closure of valves, are all considerations which have greatly influenced the favorable reception of this type of water-handling apparatus.

A New Type of Centrifugal Pump

SYNOPSIS—The striking features of this pump are the absence of diffusion vanes and the use of double-inlet impellers. Since the shaft is theoretically in hydraulic balance, there is little or no tendency for it to move endwise, and the multi-collar bearings provided serve rather to keep the rotating parts in alignment than to resist excessive end thrust.

Practically ever since the beginning of coal mining as we know it today, the reciprocating pump has held a supremacy over all other forms which has been all but absolute. In many localities, however, the centrifugal mining pump is now rapidly encroaching upon the domain of the older and perhaps better known type. This is due not to any one particular point of excellence, but to a combination of reasons.

Throughout the entire field of mechanical engineering, almost without exception it has been found easier and more convenient to govern, control and lubricate a continuous rotary motion, than one which is reciprocatory or oscillating in its nature. The moving, or working parts of the centrifugal pump may be considered as a unit, revolving about a common shaft. The problems of operation have, therefore, reduced themselves to their lowest possible terms.

One of the principal difficulties which has heretofore confronted the designers or users of this type of pump has been the tendency of the shaft to move endwise in the casing and bearings, due to the reaction of the water handled upon the impeller. This has been counteracted or taken care of by the employment of ball thrust-bearings, or a bearing of the marine multi-collar thrust type upon one or both ends of the pump shaft. In many instances these have not been altogether satisfactory in service.

Another but less fruitful source of trouble has been the tendency of the pump to suck in air through the gland, or stuffing-box, on the suction or intake of the pump, thus destroying the vacuum and rendering it difficult to raise the water.

As an industry, mining presents problems peculiar to itself, no matter what may be the type, or kind or purpose of the apparatus under consideration. Particularly, if a pump be small, it is likely to be shifted about from place to place in the mine and therefore subjected to lifts and heads which are decidedly variable. Furthermore, it will frequently be placed in a poorly lighted and often cramped position. Add to this the fact that the labor available both for installation and operation is usually unskilled, or at best only semi-skilled, and it will be readily appreciated that the work which the mine pump has to perform is in most cases at least severe, if not exacting.

To meet these varying and strenuous requirements the Epping-Carpenter Co., of Pittsburgh, Penn., have recently designed a type of pump which contains many novel features. It is built either single or multi-stage, depending upon the service required. A three-stage pump of this design is illustrated in Fig. 1.

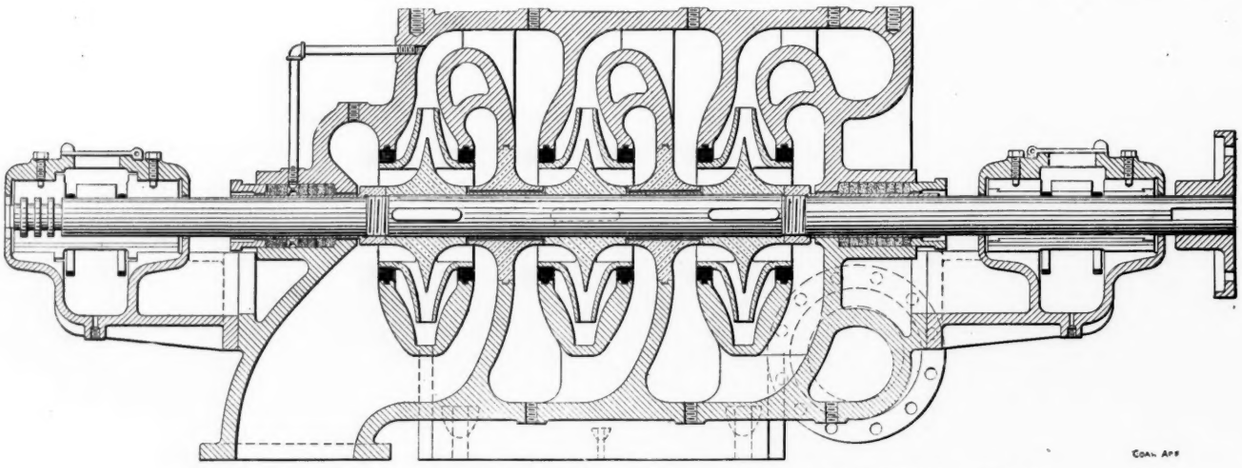


FIG. 1. CROSS-SECTION OF 3-STAGE PUMP. NOTE ABSENCE OF DIFFUSION VANES

To those familiar with this type of apparatus, two distinctive features in the construction of this pump are at once apparent. These are, first, the entire absence of diffusion vanes and, second, the double-suction impeller. The water entering the suction pipe, which is here shown to the left of the drawing, has easy access to both sides of the impeller of the first stage. After passing the first stage it is conducted to the second impeller, which it enters in precisely the same way as the first, and so on throughout the remainder of the stages.

The pump is so designed as to give as nearly as possible a uniform velocity of flow to the water throughout the various pump passages with the exception of the impellers, this condition being conducive to the maximum of efficiency.

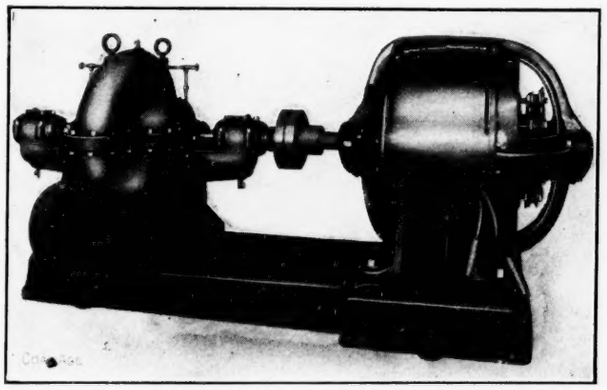
As will be noted from the drawings, the steel shaft upon which the impellers are pressed and keyed is incased from gland to gland of the stuffing boxes either by bronze sleeves or by the pump impellers themselves. It is thus entirely removed from the corroding action of the liquid handled.

As has been stated above, in pumps of this character there is a tendency for the air to creep or leak along the shaft through the stuffing box on the suction end of the pump. In this particular design, to avoid this leakage

of air an open "lantern" or frame work somewhat resembling the retainers of the ordinary ball bearing, is placed in the stuffing box in such a way that water may be conducted from the terminus of the first stage of the pump into this opening. A water seal is thus provided at a pressure which at all times exceeds that of the atmosphere and renders impossible any air leakage along the shaft.

The main bearings of the pump are of the vertically split ring-oiling type. On the suction end, as will be observed, a three-collar marine thrust is provided. Since the impellers are, however, hydraulically balanced the function of this marine thrust is rather more one of alignment—that is, keeping the impellers of the pump constantly in their proper position—than the taking care of any excessive end thrust which may come upon the shaft.

On the opposite, or discharge end of the shaft, a flanged or other coupling may be provided for attachment to motor, steam turbine or other driving apparatus. In order to take care of the rough usage and neglect to which these pumps are frequently subjected, all parts are made heavy. The casing is split horizontally and



SINGLE-STAGE PUMP AND MOTOR ON COMMON BASE

the entire pump may be dismantled for inspection or repairs without disturbing the base or foundation.

The single-stage pump is exactly similar to the multi-stage except, of course, that it has but the one impeller. A water seal is provided in both stuffing boxes, and a collar upon either end of the shaft takes care of any slight end thrust which may exist.

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Some of the features of a new electrical pumping installation at the Dover collieries, England, are more or less novel in mining work. Among these are the variation of output of the centrifugal pumps, the increase of the load on the alternators by means of air blades, and the fool-proof combination of switchgear for the starting of two motors coupled to the same pump. The high-tension motors are dried by means of a low-tension current.

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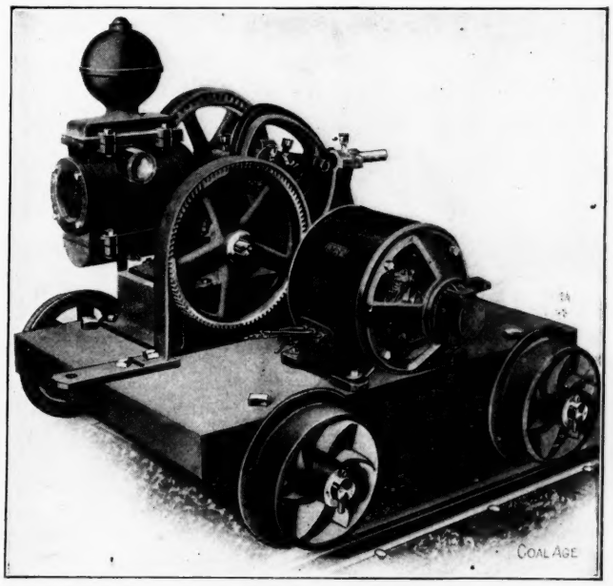
The Manor Powis coal field, Stirling, Scotland, presents a very interesting geological formation. The Carboniferous limestone series are underlaid by a great sheet of basalt, and the degree of anthracitization is determined, to a greater or less extent, by the distance of the seams from this basalt. At the time this sheet was thrust up it was intensely hot, so that its effect on the coal above was to reduce some of these seams to graphite and materially change the character of the others. The six seams of the horizon show, in regular gradation, the effects of this intense heat. The lowest are burned beyond anthracite, the next are anthracite, the middle seams, coking coal, and the upper, bituminous.

A Small Portable Electric Pump

The accompanying illustration shows a new type of portable electric mine pump which has recently been placed upon the market and is now carried in stock by the Harris Pump and Supply Co. of Pittsburgh, Penn. This machine is designed particularly for dips and entries or for follow-up work where but small amounts of water are encountered, and the head against which it is to be raised is not great.

The construction is such that air entering the suction even in considerable amount does not stop the operation, neither do small quantities of solid matter such as sand or mud clog or seriously interfere with the proper action of the valves.

The pump is ordinarily built for handling pure water



PUMP AND MOTOR MOUNTED UPON A TRUCK

but the substitution of a solid bronze water end renders the machine capable of coping with water which is strongly sulphurous.

A valuable feature of this pump as illustrated is that the motor can be and regularly is made self-starting. One wire is grounded through the truck while the other may be hooked over the trolley wire which starts the pump instantly.

The cylinders of this machine are five inches in diameter while the stroke is four inches, the rated capacity being 30 gal. per minute while the maximum head against which the pump is intended to work is 100 ft. Connections are provided for a 2½-in. suction and a 2-in. discharge. The truck wheels are 12 in. in diameter and the height over all is consequently only 42 in.

This pump is usually made in from 39-in. to 44-in. track gage but if sufficient head room is available it may be raised up so as to accommodate any gage smaller than those above mentioned.

The motors ordinarily furnished with these pumps are either 230 or 500 volts direct current. Any other kind or type of motor of suitable power and speed could, however, be employed, the above being merely the voltages most commonly encountered.

A Large Triple-Expansion Pump

The general appearance and characteristics of operation of the ordinary duplex plunger steam pump are familiar to almost all mining men. Whatever may be the merits of such machines as concerns durability and reliability, they are notoriously extravagant in their consumption of steam. If such machines are, however, made triple expanding and such refinements as steam-jacketed cylinders, rotary valves, etc., are introduced the high rate of steam consumption may be decidedly reduced and the efficiency of the unit correspondingly increased.

The Goyne Steam Pump Co., of Ashland, Penn., which manufactures mine pumps exclusively, has just completed a large triple-expansion condensing pump for the Exeter colliery of the Lehigh Valley Coal Co. As the installation of this machine has not yet been completed, it has not, of course, been put in operation and no data are available from the operating standpoint.

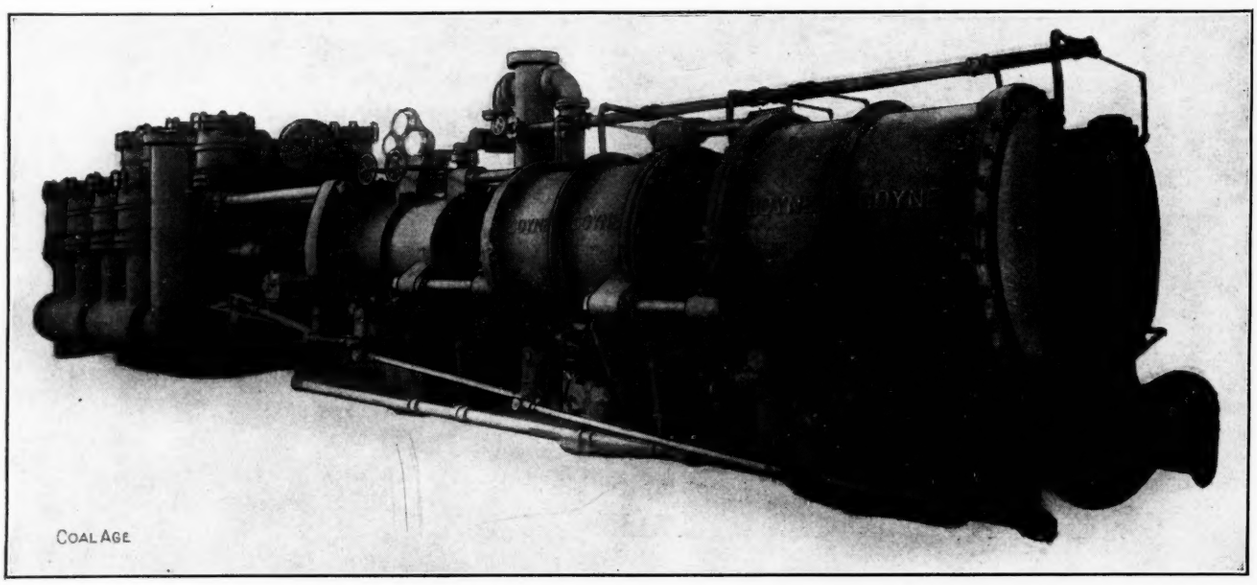
This machine was, however, designed to work against a vertical head of 650 ft. and to deliver 2,000 gallons of water per minute. The high-, intermediate- and low-pressure cylinders are 20 in., 30 in. and 45 in. in diameter respectively. The plungers are 14 in. in diameter and the stroke is 36 in. Both the high and intermediate steam-pressure cylinders and their heads as well as the heads of the low-pressure cylinders are steam jacketed.

The steam valves are of the semi-rotative type and the high-pressure cylinders are fitted with the Goyne adjustable cutoff, which is capable of alteration while the pump is at work. Each of the six steam cylinders is lubricated by a power-driven oil pump and a record of operation is made by a six-figure revolution counter.

The steam separator and cylinder jackets are drained by separate traps and steam is supplied to operate the condenser from the discharge end of the cylinder-jacket main drain pipe, which assures dry steam in the jacket. The arrangement of cylinders, cylinder heads and piston rods is such as to give the easiest possible access to the internal parts. The total weight of the pump, exclusive of condenser, is 160,000 pounds.

As this pump will be called upon to handle water which is strongly aciduous the water end is entirely wood and bronze lined as a protection against the corrosive action of such liquid.

Owing to the varying circumstances in colliery operation it is not always possible to maintain a steam pressure which is even approximately constant. Should a condition arise whereby the steam would drop to a pressure that would not give the required piston speed to meet the water conditions, this pump is fitted with an appliance such that by the manipulation of a valve (which can be accomplished in a fraction of a minute) the high-pressure cylinders may be thrown out of service and the pump for the time being operated as a compound machine.



A 2000-GAL. TRIPLE-EXPANSION PUMP FOR USE IN AN ANTHRACITE COLLIERY. NOTE ROTARY STEAM VALVES

It might be mentioned also that the manufacturers of this pump are now engaged in building four other large station pumps of practically the same type except that these latter will be compound instead of triple expansion.

A Filtration and Pumping Plant

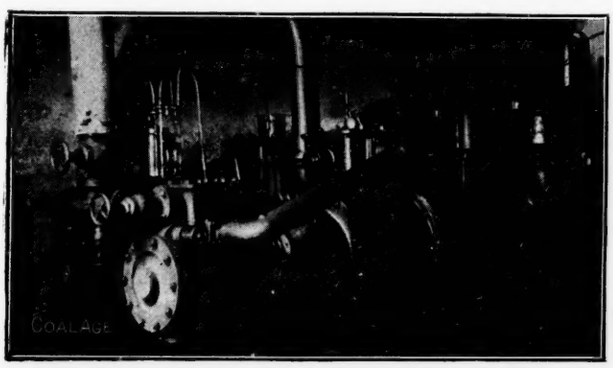
The problem of providing an adequate and suitable house-water supply at many of the larger mining operations, especially those which are isolated from any town of considerable size, is one which requires careful consideration upon the part of the designer in laying out the plant.

As the pumps supplying such a domestic water system will probably be called upon in the contingency of fire, they should be selected with a view to a large overload or emergency capacity.

The Pittsburgh-Buffalo Co., at their mine at Marianna, Penn., have such a plant installed. The machines selected for this purpose are two Jeansville compound duplex direct-acting plunger pumps which are duplicates of each other. The high- and low-pressure steam cylinders are 12 and 24 in. in diameter respectively. The

plungers are 8 in. in diameter and the stroke is 18 in. The suction and discharge of these pumps are each 10 in. These have, however, been bushed down to 8 in. in both cases. The steam supply pipes are 3 in. in diameter and the exhaust 6 in. The pumps are provided with rubber pot valves, 10 in. in diameter.

Steam is supplied to these machines at about 140 lb.



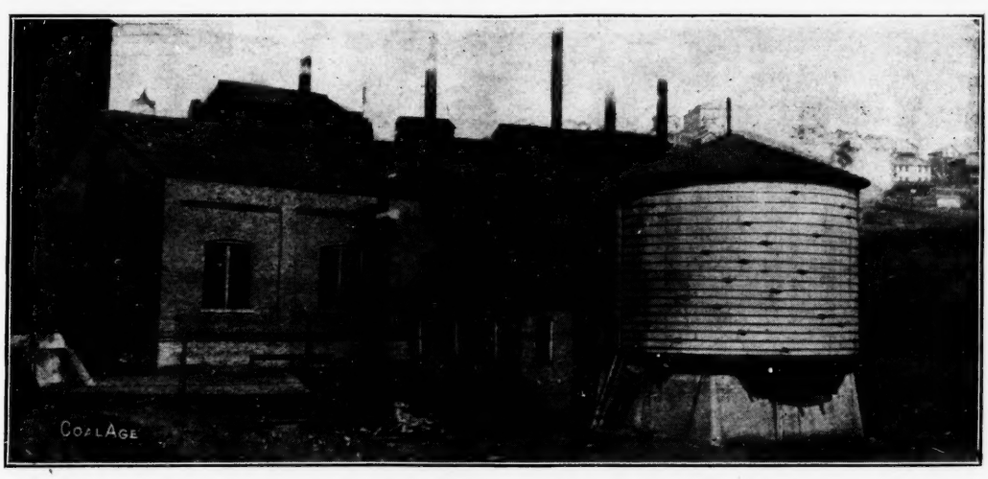
ONE OF THE TWO COMPOUND PUMPS HANDLING HOUSE WATER

pressure per sq.in., while the exhaust is made to the atmosphere. Both pumps are lubricated by means of a forced-feed oil pump. They are set upon solid concrete foundations in a brick pump house, with concrete floor about 6 ft. below the ground level. They ordinarily operate at approximately 50 strokes per minute. Each machine is provided with all necessary priming and drain pipes on both steam and water cylinders.

Under ordinary operating conditions, one of these pumps draws raw water from Ten-Mile Creek, and discharges it into a tank. From here the water flows to the treating plant where it is subjected to the action of a solution of alum to effect purification. After being thus treated chemically, the water passes through a filter from whence it is conducted to the suction of the second pump.

This machine draws its supply of filtered water from the purification plant, and discharges it into a house-supply tank located on a hill at an elevation of approximately 600 ft. above the pump. This tank is about 200 ft. above the highest point where water might be needed for fire purposes.

In case of emergency, provision is made so that both pumps may draw their water supply direct from the creek and deliver it to the reservoir through two separate 8-in. pipe lines. This places an abundant supply of water at a pressure equivalent to at least a 200-ft. head at the disposal of the company in case of fire or any other emergency.



EXTERIOR VIEW OF FILTRATION PLANT. HOISTING PLANT AND BOILER HOUSE IN BACKGROUND

A New Stripping Company

The exchange of big coal holdings and the organization of new mining companies are frequent occurrences in Pittsburg, Kan., and the surrounding coal fields. This is especially true of the strip pit mining industry. The most recent corporation to be formed is the Moka Coal Co., with Thomas W. Caffey, George Williams, William Williams, A. L. Blair and Oliver T. Jones as the members. Mr. Jones is the practical coal man of the group, he having had considerable experience in various phases of the business. The new company, capitalized at $30,000, has leased 165 acres of land with a shallow lying vein from Miller Bros., of Mulberry, toward the north end of the coal field and on the Missouri-Kansas line, from which fact the name "Moka" is derived. A big steam shovel will be put to work in the near future, and it is said $35,000 will be necessary to start operations.

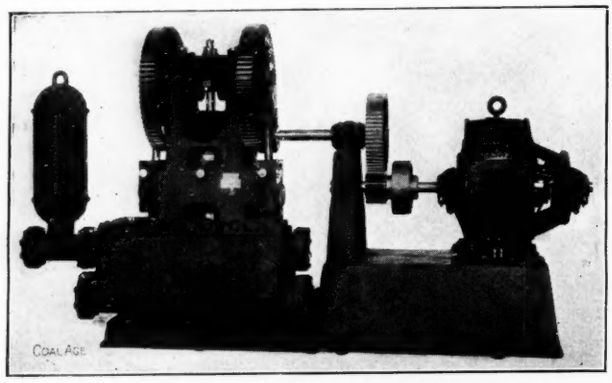
Options on coal lands are being taken up or renewed all over the district, both in shallow and deep-vein tracts. The shallow coal is mined by stripping off 10 to 20 ft. of earth with steam shovels. The Southwestern Development Co., which is known as a subsidiary of the M. K. & T. Ry. Co., and George K. Mackie, of Scammon, a well known operator, recently have been buying options and renewing old ones to the south and west of the present prospected district, in Crawford and Cherokee counties. Miller Bros., coal-land dealers of Mulberry, have just completed buying options and renewing others on 3700 acres on the north edge of the district. Much of the territory has not been prospected, but great confidence is felt because of showings made on part of the holdings.

The United States Government still owns over 70 million acres of coal land in the West. Some parts of this immense acreage contain beds of high-grade coal ranging from 30 to 80 ft. in thickness.

An Electric Water Supply Pump

At many mining plants by no means all of the pumping which is done, is for the purpose of mine drainage. Power plants must be supplied, dwelling houses must be provided with drinking water, and provision must be made for fire protection.

At the Crescent mine, of the Monongahela River Coal & Coke Co., near California, Penn., there is installed an 8x10-in. Deming vertical triplex pump in a sump under the tipple. This machine is geared to and driven by a Westinghouse 25-hp. interpole motor, which operates at 685 r.p.m. upon a current of 500 volts.



THE PUMP, SHOWING HOW IT IS GEARED TO THE MOTOR

The rawhide motor pinion is keyed to an extension of the motor shaft, which is attached thereto by means of a flexible coupling of the flange and rubber buffer type. This extension shaft is provided with an outboard bearing outside of the pinion.

Meshing with the motor pinion there is a gear upon a countershaft, which extends across the frame of the pump. This shaft carries two pinions, which engage the main or driving gears upon the pump shaft.

The two gears above mentioned serve not only to drive the crankshaft, but are themselves crank disks, pins being provided to drive the two outer plungers of the pump. A center crank is also located between the two main pump bearings, which drives the middle plunger.

All gears are cut and the ratio of reduction is such as to drive the crankshaft of the pump at approximately 47 r.p.m. when the motor is running at full speed.

The pump and motor bases are separate, but are bolted securely together, thus forming practically one base plate. The motor is raised a sufficient height from the floor to largely obviate any danger from water which frequently accumulates upon pumphouse floors.

The pump is provided with a 6-in. suction and a 5-in. discharge. Both of these openings have, however, been bushed down to 4 inches.

The unit as a whole is compact and all parts are readily accessible. The plungers are of bronze, single acting, and the pump chambers are all wood lined.

This machine draws water from the Monongahela River, and forces it through about 2½ miles of pipeline to the town and power plant, at Crescent.

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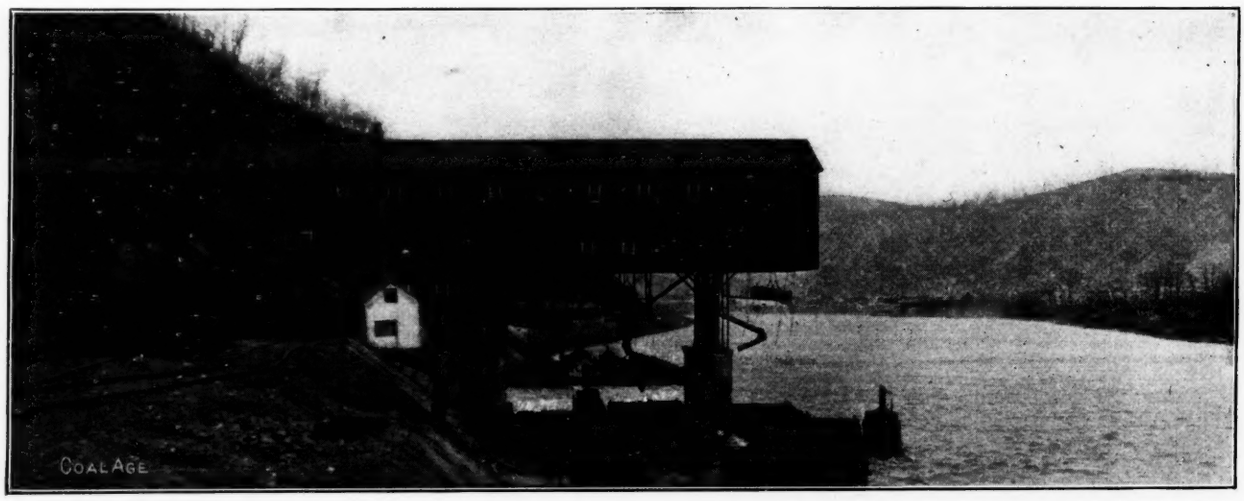
Panel Board Lightning Arresters

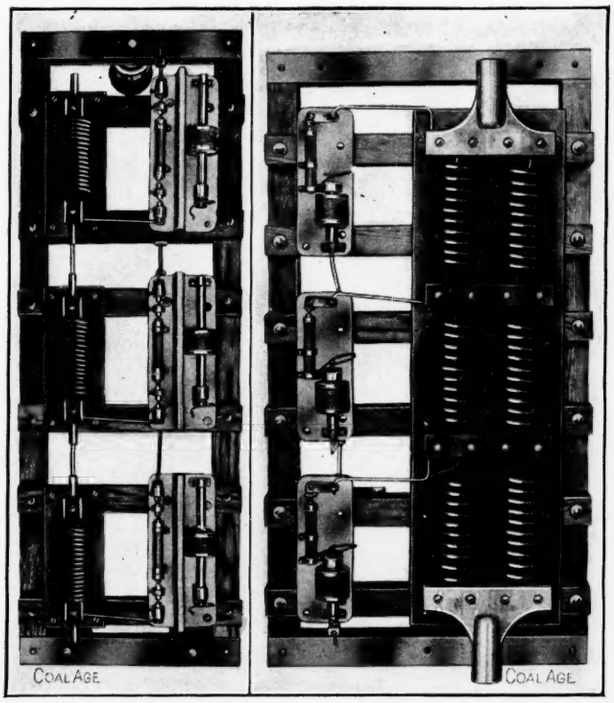
A great many railway, lighting, mine and industrial properties have certain "spots" where lightning conditions are particularly severe, and where it is difficult to secure thoroughly efficient and reliable protection. In other cases, particularly in central stations, there is certain electrical apparatus that needs, what may be termed, one hundred per cent. protection, as, for instance, power for the fans and pumps. For the protection of these important installations, the Electric Service Supplies Co., Philadelphia, has placed on the market a line of panel-board lightning arresters, for both direct- and alternating-current service; illustrations of typical boards for both are shown herewith.



THE CRESCENT TIPPLE OF THE MONONGAHELA RIVER COAL & COKE CO., BENEATH WHICH PUMP IS LOCATED

These boards are built on the well known law that no matter how efficient a lightning arrester may be, it will never carry off the entire discharge from a given line; some small portion will always find its way past an arrester and into the apparatus to be protected. With an efficient lightning arrester, however, and a suitably designed choke coil, this leakage will be small and usually not enough to damage the apparatus, but with heavy induced strokes, and under certain other conditions, this is not the case.

The arresters here described effectually take care of



DIRECT- AND ALTERNATING-CURRENT ARRESTERS

this leakage by interpoling additional choke coils between the line and the apparatus to be protected, and by connecting lightning-arrester units ahead of these coils. Any leakage passing the first arrester unit, for instance, in a triple board, must pass through three choke coils and by two additional units before it can get into the apparatus.

With but a single choke coil and a single arrester unit, and assuming that nine-tenths of the discharge goes to ground through the arrester, it is seen that one-tenth will be left to enter the apparatus. If an additional choke coil and a second arrester unit be placed back of the first, and assuming that the second unit takes nine-tenths of the one-tenth leakage to ground, obviously only one-one hundredth of the original charge remains to flow into the apparatus. Similarly with a third choke coil and a third arrester unit, but one-one thousandth of the original charge will leak through. In other words, by the addition of extra arrester units and extra choke coils, the protection has been increased ten times by a double panel board, a hundred times by a triple board and a thousand times by a quadruple board.

These arresters are not new by any means, having been furnished numerous companies all over the country for the protection of apparatus under unusally severe conditions. The boards are regularly furnished in station type, mounted on heavy impregnated oak framework and are furnished complete with insulators for attaching to any suitable support. The arresters are furnished with highly polished and lacquered metal work. Choke coils are of copper, black enameled and baked.

They are designed especially for the protection of apparatus up to 6600 volts alternating current, 2500 volts direct-current railway and 6000 volts direct-current arc circuits, and are furnished in any ampere capacity for voltages within this range.

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Recovery of Mine Timber

BY J. W. POWELL*

SYNOPSIS—The need of drawing timber in all worked-out places is emphasized by the fact that timbers left standing in the waste cause a loss of coal by throwing undue weight on the pillars and crushing them, and by making it necessary to build packwalls, etc., that would not otherwise be required. The Sylvester machine for drawing timber is described.

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The timber needed daily in the operation of a colliery often exceeds the cost of any other kind of material or supplies. Any means, therefore, of reducing the heavy expenditure should be at once welcomed. Although mine props and sets of timber are often broken a short time after being set, the broken ends are valuable as they can still be utilized for the purpose of cap-pieces, wedges, track ties, or for the building of "cogs" or "chocks." Also, post timber broken in a thick seam can often be used again, in a thinner seam at the same colliery.

In some mines there is a considerable loss of timber, through the carelessness of miners who will let them lie in the waste where they are finally buried. By keeping a careful watch in their daily rounds through the mine, the mine officials can do much toward reducing this loss or waste of timber.

I want to emphasize the importance of drawing all kinds of timber, as the work proceeds, using, if necessary, some suitable appliance for this purpose. Timbers left standing in the waste often cause a loss greater than

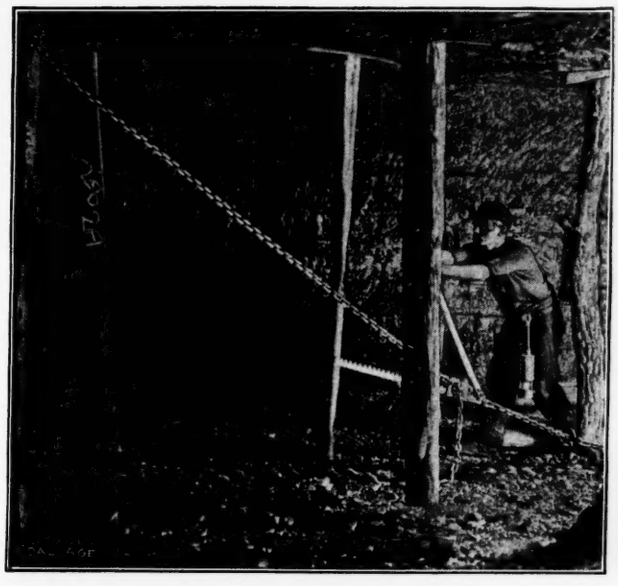


FIG. 1. DRAWING A POST IN THE THIRD ROW FROM THE FACE OF AN ADVANCING ROOM

*Mine Manager, Columbia Coal & Coke Co., Coalmont, B. C., Canada.

their own value, by preventing the roof from caving and frequently making it necessary to build extra packwalls or timber cogs to keep the roads open. The material for these packwalls often has to be transported a considerable distance; whereas, if the timber was drawn and the roof allowed to fall, there would be plenty of material for the building of all necessary packwalls in most cases.

Again, under many conditions, when the roof does not fall but a large standing area is kept open a great weight is thrown on the timbers standing next to the face of the coal, with the result that these timbers are broken more quickly, or they kick out and the roof is ruptured at the face. When this occurs, the condition is bad, as the influence of the roof in breaking the coal after the latter is undermined, is destroyed. When the roof is of such a nature that it breaks readily, I believe it is a good policy to set a line of large breaking posts, with good sized cap-pieces, on one side of the track, which should be carried along the straight rib of the room.

Under these conditions, when the timbers are drawn

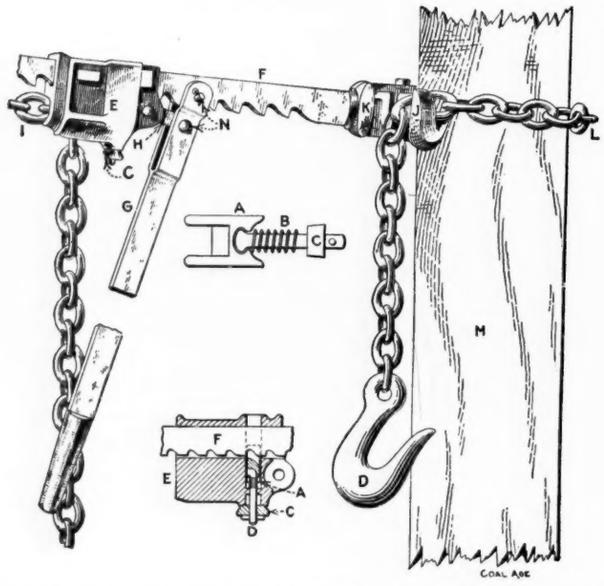


FIG. 2. SHOWING DETAIL OF THE SYLVESTER MACHINE FOR DRAWING POST TIMBERS

in the waste, as the face of the room advances, up to the last crosscut, there is not only a saving of timber, but the caving of the roof prevents the crushing of the pillar coal when the roof "weights" and cannot fall. In heavy-pitching seams, the recovery of timbers is much more difficult and dangerous than in flat seams; because the worked-out portion, from which the timbers are drawn, is located up the pitch, and any loose pieces of rock that fall when the post is drawn are liable to roll or slide down upon the men engaged in drawing the timber who are unprotected.

The danger may be avoided, in part or wholly, by using a long ½-in. steel cable or chain that will reach from the timbers to the first crosscut, in which the drawing machine should be placed. This will not only afford the necessary protection for the men, but will enable them to recover a larger percentage of timbers. The cost of timber in pitching seams is much greater than in flat seams, owing to the labor required in handling the timber on steep pitches. In a seam pitching 35 deg. I have found the cost of timber to amount to an average of about 5½c. per ton of coal mined. This was in a mine where the roof conditions were fairly good.

Although most mine managers are, no doubt, familiar with the appliances in use for drawing timber, a brief description of the Sylvester machine, which I have found is the best for that purpose, will be of interest. The general method of using this machine in a flat seam is seen in Fig. 1, which shows a miner in the act of drawing a post, in a thick seam of coal. In general, the head of the post resting on a cap-piece will be disloged more quickly than the foot of the other post to which the machine is anchored, especially if the bottom is rough or soft. Caution, however, is always necessary to see that the machine is properly anchored before attempting to drawn another post. If this is not done the post to which the machine is anchored may be dislodged and the miner operating the machine be caught by the falling slate and killed or severely injured.

The Sylvester machine is very simple in construction, and is shown in detail in Fig. 2. It consists of a notched bar *F*, 3 ft. long, 1½ in. deep and 5 in. wide. The notches are cut 1 in. apart and ½ in. deep and shaped as shown in the figure. To one end of the bar is attached a 3-ft. chain *L* which is passed around the post *M* and fastened or held by the chain block *J*. Sliding on the rack is a heavy block *E*, to which a 3-ft. hand lever *G* is attached by the link *H*, and by which the block *E* is worked along the bar, from notch to notch.

One end of the long chain *I*, having been attached to the post that is to be drawn, the chain is attached to the block *E*, by slipping a link into a recess in the side of the block. The bolts *N* in the end of the hand lever are 1 in. apart, which gives a leverage on the block *E* of practically thirty times the force applied to the lever. As the block *E* is moved along the notched bar, it is held by the pawl shown in detail below, in the same figure. The pawl *A* is actuated by the spring *B*. A detailed section of the block showing the operation of the pawl is shown also below. When it is desired to release the block *E* the lever *G* is moved forward slightly to relieve the pressure on the pawl, which is then drawn out by pulling on the crossbar head *C* and giving it a half turn, to place it crosswise of its recess. This holds the pawl back, and the block *E* can be moved in any direction. The large hook *D* on the end of the chain *L* is for use, if needed for attachment in another manner than what is shown in the figure.

Limiting Coal Profits in France

On Mar. 4 the French Chamber adopted an amendment to the Finance Bill, which has the support of the government. It takes the form of a tax on each ton of coal shipped or sold, on all mines whose net earnings amount to 20c. or more per ton. The tax, it is understood, will become operative on Oct. 1. In the case of mines whose net profit is quoted as from 20c. to 30c. per ton, the tax imposed will be equal to the excess in the value over 20c. As reckoned, the tax will therefore amount to 10c. or more per ton when the profit is 30c. or over. The estimate of the finance minister is that the tax will bring in $2,800,000.

A Pump Designed for Acid Water

SYNOPSIS—A mine pump should be sectionalized to facilitate transportation and erection underground. It should be as nearly acid-proof and as efficient as possible, but above all it should be dependable. This article describes a pump which has been designed with all of these points kept constantly in mind.

In different sections of the country and even in various mines in the same district, the conditions under which the pumps operate vary to a considerable degree. In some instances, the pump rooms are large, well lighted, comparatively dry, and the water free from acid. The engineer, or pump runner, is a competent man supplied with the necessary tools and equipment for properly taking care of and getting the best results from the apparatus placed under his charge. In such cases, standard pumps similar to those used in stations on the surface will often meet all requirements.

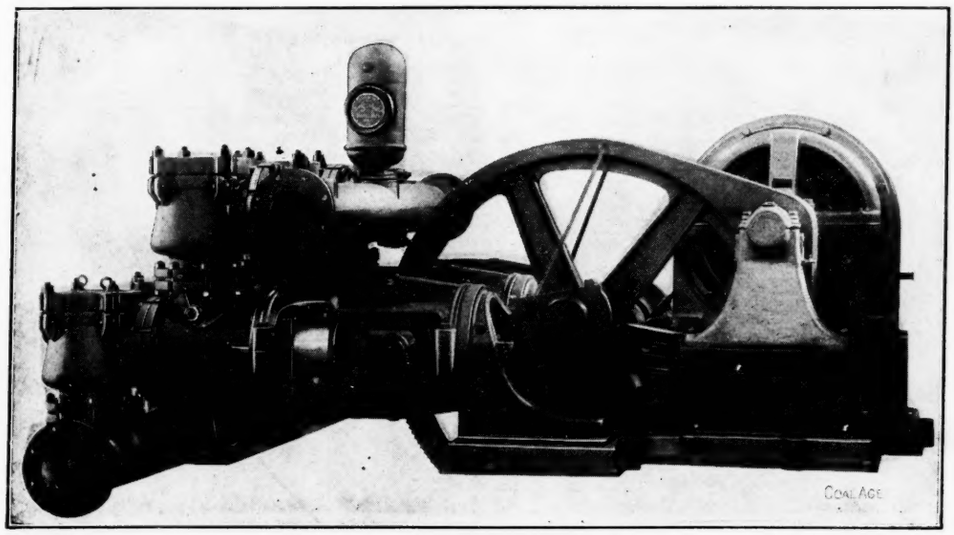
Frequently, however, the conditions are quite different, and special construction is necessary to satisfactorily cope with the exacting service, and a careful study of the actual operating conditions is essential in order to provide reliable and efficient machinery.

In general, a mine pump must have the following characteristics embodied in its design, together with any special features that may be necessary to meet local conditions. The various parts must be sectionalized to such an extent as to permit their being lowered through shafts of limited dimensions, and the separate castings must be of such size and weight as to be readily handled in limited quarters without the use of a crane. Furthermore, in order to lessen the liability of flooding the mine, the pump must be as reliable as possible, extra heavy in all its parts, provided with large wearing surfaces, protected from corrosion, and of such construction that replacement and repairs can be made in a minimum of time.

While reliability is a primary consideration, yet the cost of power must by no means be forgotten. Many pumps, particularly in coal mines, have to handle water containing such a percentage of acid that it will attack and quickly eat out cast iron. The water ends of such machines must be so protected, that none of the iron castings come in contact with the water.

The accompanying illustration shows a pump designed and built by the Dean Steam Pump Co., Holyoke, Mass., which is intended to meet the severe conditions of coal-mining service.

The pump is of the triplex type maintaining a practically constant and uniform flow in the discharge column. It is fitted with one air chamber on the suction pipe located directly in the line of the suction flow and with three air chambers on the discharge so located that one is directly over the outlet from each cylinder, thus tending to take the peak of the discharge and overcome any tendency to acceleration or retardation in the flow of the discharge column.



TRIPLEX PUMP GEARED TO MOTOR

A uniform rate of flow makes the load on the motor constant and tends toward a high efficiency. The plungers which operate horizontally are 12 in. in diameter with a 12-in. stroke giving at 48 r.p.m. of the crankshaft a capacity of 800 gal. The total head is equivalent to 400 ft., making 81 hp. in the discharge column. The mechanical efficiency of the pump is approximately 85 per cent. so that the 125-hp. motor used for driving has an ample surplus capacity.

The speed of the driving motor is 365 r.p.m. and the crankshaft is driven through single reduction herringbone gears, protected by a sheet-steel guard.

The motor is placed on a heavy base plate securely attached to the pump base and is raised a sufficient amount to prevent damage in case of water on the pump-room floor. A heavy outboard bearing on the armature shaft maintains the alignment of the pinion with the gear.

The main gear is mounted on the crankshaft of the pump between two of the main bearings and is thus rigidly supported upon either side. Perfect alignment of herringbone gears, which is essential to their proper op-

eration, is thus secured by the ample supports provided for both members of the train.

The crankshaft is a steel forging carried in four babbitted bearings each provided with chain oilers. An open-hearth annealed steel casting disk with a large crank-pin made as an integral part thereof is pressed upon the crankshaft at either end. A center crank is also provided which drives the middle plunger. The connecting-rods are steel forgings fitted with wedge and screw adjustments on each end. The crossheads operate in bored guides and are fitted with adjustable shoes both top and bottom. They carry large engine-type taper-fit steel wristpins.

All parts are readily accessible for adjustment, a particular feature being the split cradle or yoke which permits the removal of the upper half without disturbing the other parts of the machine. The enlargement of the yoke at the water end offers ample facilities for access to the glands and stuffing boxes.

Provision against Grit and Acid

All waterways are made large, thus avoiding the high velocities which are so detrimental to pumps carrying acid or sand in the water. As these machines are designed for use where the fluid handled is aciduous, it is necessary that the whole water end be protected against the corrosive action encountered. The cylinders, valve pots, suction and discharge pipes are therefore carefully lined with soft wood, and the valve details and plunger coverings are of acid-resisting bronze.

The valve seats are securely held in place by a flange bolted between the valve pots and the adjacent castings. The wood lining is fitted around the valve seats in such a manner that no water can gain access to the valve pot casting. Each pot contains a single large bronze valve with rubber face of the double-port type giving an ample area and unrestricted flow. All valves are readily accessible through large covers secured by swing bolts making inspection quick and easy.

The valve pots, which are all duplicates of each other, are held by through bolts in slotted holes on both flanges so that the replacement of a complete pot is easily accomplished. A large by-pass connection made of bronze pipe and fitted with a gate valve of similar material is provided to relieve the load when starting. Connections which may be used either for priming or washing out are made on all the cylinders and valve chambers. In the design of the entire water end of this pump, one of the principal objects in view has been to secure permanency and reliability, while at the same time providing means for making any necessary repairs or replacements in the shortest possible time.

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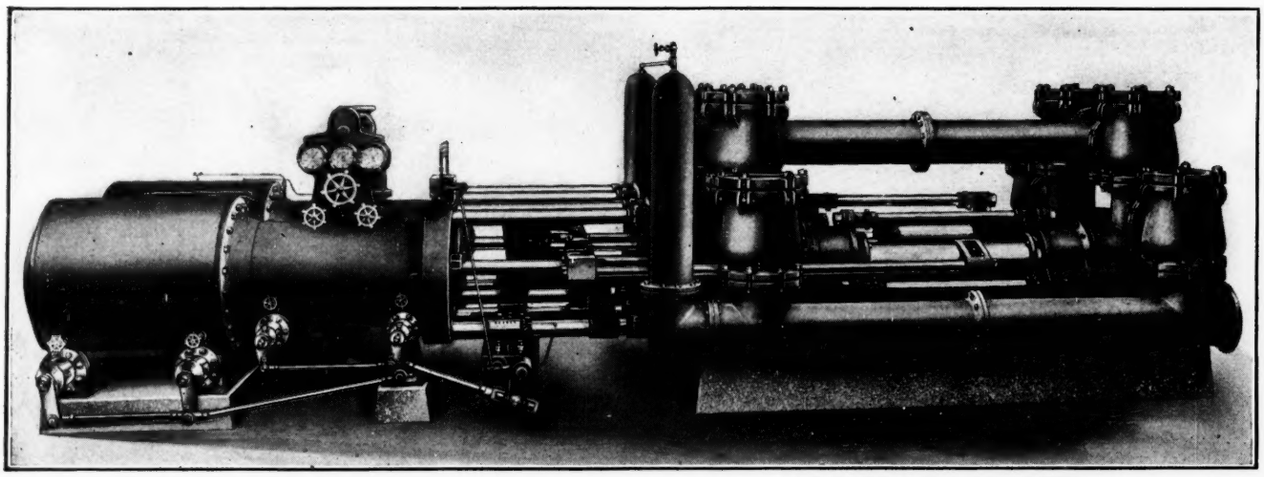
A Steam Pump at an Anthracite Colliery

In many coal operations throughout the country, particularly those where adequate power facilities were installed a number of years ago, or where the mines are so gaseous as to render electric power distribution dangerous, the steam pump is still largely employed. In the majority of such cases, not only is the steam consumption of the machine important, but the accessibility of all parts is a feature which must be carefully taken into account.

The accompanying illustration shows a compound, condensing, direct-acting, duplex, Jeanesville mine pump built for the Lehigh Valley Coal Co., and installed at the Dorrance Colliery, at Wilkes-Barre, Penn.



Compound Pumping Engine. Note Arrangement of Crossheads

This pumping engine has a capacity of 1500 gal. per min. and operates against a head of 650 ft. with 80 lb. steam pressure at the throttle. It is supplied with an independent steam-operated jet condenser. The steam end of the pump is of the standard compound type with high- and low-pressure cylinders, 22 in. and 34 in. in diameter, respectively, while the stroke is 36 in. Each cylinder is provided with two semi-rotative steam valves placed below the cylinders.

The pump end of the machine is of an improved design. It is of the four-plunger outside center-packed type in which the front and rear pump plungers are coupled to the cross head located between the pump cylinders. This plunger cross head is connected to the main cross head by two side rods placed upon either side of the pump-water cylinder.

This arrangement eliminates internal rod or plunger connections and thereby assures perfect accessibility to the plunger stuffing boxes. As the water to be handled is strongly aciduous, the pump end, its valve pots and pipes are wood lined and bronze fitted.

Safety First

By J. E. Jones*

Written expressly for "Coal Age"

In the morn on your way to work,
Safety first.
In the darkness, dangers lurk,
Safety first.
Be cautious as you pass along,
Life's not all a cheerful song;
Watch; you may find something wrong.
Safety first.

As you reach your place of toil,
Safety first.
Lest some mishap your welfare spoil;
Safety first.
Sound your roof for fear it might
Have been weakened through the night,
Then test it often; don't trust sight:
Safety first.

If it's hard to keep the turn;
Safety first.
Don't chance your life, you'd better learn
Safety first.
A minute's risk will sometimes mar
An entire life, so better far
Be careful; rather miss a car.
Safety first.

If you have to ride a trip,
Safety first:
Take precaution lest you slip,
Safety first.
"Riding in between's" a crime
Against yourself; against your mine:
Ride where safe and take your time.
Safety first.

When making "dope," take off your lamp;
Safety first.
Be very careful while you tamp;
Safety first.
Fuse it so there'll be no fear
Of firing until all is clear:
Don't fail to use good judgment here.
Safety first.

If the mine is making gas,
Safety first.
Use great care or you may pass
(Safety first.)
Into realms beyond the sky
In the twinkling of an eye
If you do not heed the cry
Safety first.

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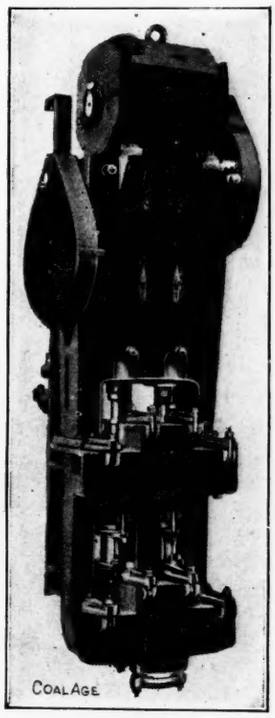
Firebosses, who must necessarily go their rounds alone by the dim light of a safety lamp, should insist that the miners make good manways, especially on steep pitches, in order that their work be as safe and easy as possible. Unless this has been done, compel the miners to stop work until the defect is remedied.

*505 West Madison St., Danville, Ill.

An Electric Shaft Sinking Pump

The sinking of a shaft has been one of the mining processes which up until recently has usually called for some kind of a steam pump to rid the opening of water as rapidly as it was encountered. Recently, however, electric machines have been introduced which will compare favorably with those driven by steam.

The accompanying illustration shows an electric mine-sinking pump which had been placed upon the market by the Goulds Manufacturing Co., of Seneca Falls, N. Y. It is of the quadruplex outside-packed plunger type. The four plungers, operated by connecting rods from the 2-throw crankshaft, produce an almost continuous flow of water, the cranks being set at 90°. All exposed working parts are protected by iron casings so the pump cannot be injured by coming in contact with the sides or framing of the shaft or from falling rocks.



Electric Sinking Pump and Motor

The main frame and guides are cast in one piece and provided with hand-hole openings for examination of working parts. Wrought-iron hanging bars and clamps are also provided. The gear wheel is of charcoal iron, meshing with a bronze motor pinion, both being cut from the solid and fully protected by gear covers. The cylinders and valve boxes are of charcoal iron made in one casting. The four cylinders are each fitted with a bronze lining.

The plungers are of cast iron and are operated by steel plunger rods. The valves are rubber disks on bronze grid seats with cylindrically wound springs. Any type of motor may be used on this type of pump, the power ranging from 10 to 30 hp. while the capacity varies from 75 to 205 gal. per min., according to size, all of the pumps being designed for a working pressure of 130 lb.

WHO'S WHO—IN COAL MINING

Hitherto we have not recorded the lives and characters of those who are changing the face of the South by opening up its coal deposits. When we begin to describe a Southern operator, we are impressed immediately with a new atmosphere. The Southern planter has always had a paternal interest in his farm hands and the activity of the Southern coal operators and managers in studying hygienic conditions, in engaging others to aid them in that study and their willingness to put into expensive operation such improvements as their inquiry shows to be necessary, reflects the generous spirit of the South.

In this respect, W. C. Tucker, "father of Benham," and bred in the South and hoping ever to make it his home, is typical. To him, the coal plant he manages at Benham, Harlan County, Ky., is no mere industrial venture, it is a community development and it is destined to set a number of valuable precedents like those of the other steel-plant collieries throughout the States.

W. C. TUCKER

W. C. Tucker was born at Columbus, Miss., in 1864. Had it not been for the Civil War and the consequent impoverishment of the South, Mr. Tucker would have been a lawyer and planter, for his leaning was toward the law and the call of the land is strong in the South.

His father's failure in '79 permitted him to stay but two more years at school and at 17 years of age he started work with an engineer corps on railroad construction. The work finished, he entered the coal industry by assisting in the survey of several coal lands in Walker County, Ala., then newly opened. Some knowledge of the underground operations was obtained by the monthly "measuring up" in which he took part.

This work being finished, he returned to the farm but the free yet strenuous life of the engineering corps appealed insistently and another railroad survey being started in the vicinity, he entered the corps as a rodman. Returning to the farm at the completion of this work, he filled in an interval by farming, teaching school and getting married.

But he soon returned to railroad construction, being promoted this time to assistant resident engineer, in charge of the completion of 13 miles of track. This work done he left for another road with promotion to assistant chief engineer. Leaving this position because a promised leave of absence was withheld, he entered business life for a brief period as a partner of a cotton broker.

A serious illness of his wife caused him to withdraw from all activities for several months and he then entered the real practice of coal mining as a weighman. He left this company to act as a surveyor for another coal corporation. A little later he entered the office of which he was soon put in charge.

A change of management, and Tucker was back again on the farm, but the mine life seemed more exciting and he was soon employed in prospecting a number of coal properties. These condemned, he went to a furnace at Middlesboro, Ky., staying there a year and being transferred by the same concern to be manager of their mines in Tennessee and North Carolina. This first independent command was held for several years, each year being signalized by an increase in salary.

He resigned this position to go as chief surveyor and prospector for a large acreage in Kentucky, a portion of this land covering the site of the present town of Benham. The land was purchased by a Northern syndicate, and although left undeveloped for a number of years, Mr. Tucker was retained as engineer in charge.

Tiring of the trivial duties of managing an undeveloped land holding, he crossed into Virginia to accept a position as superintendent of the Imboden Coal & Coke Co., and in two years was made manager. He held the position for a year and resigned to be division superintendent of the Southern Iron & Steel Co., with his headquarters at Chattanooga. He was in full charge of that division, including its coal and ore mines, quarries, coking plants and furnaces. His work was appreciated, but after a few months the panic of 1907 caused the company's failure.

Then followed a small coal plant in Kentucky which he managed for friends. Money being scarce and the market poor, the plant was a failure and for a year he went as superintendent of the Federal Coke Co.'s plant, at Grant Town. While there the properties which he approved for purchase many years before were repurchased by the Wisconsin Steel Co., a subsidiary of the International Harvester Co. They had decided to build a coking plant and offered him the superintendence.

This plant, which embodies all the ideas acquired in long years of thought, is now nearly complete, and is Mr. Tucker's "labor of love."

EDITORIALS

The Mine Pump

The danger of our careful distribution of charges as indorsements on the payroll is that we overlook their inevitable inaccuracy as guides to the true expenses of operation.

Thus what we head as "Drainage" covers only a few of the costs to which we are subjected by the presence of excessive water in the mine. The cost of inadequate pumping facilities crops up in nearly every item in the column of distributed charges.

For instance it appears under "Haulage" because cars dragged through water lose the oil in their bearings and are hard to haul, because the mules and motors are unable to do their best if the road is wet and because when many working places are filled with water, the work is scattered and the territory to be served by one unit is too widespread.

Water losses are hidden under "Headings and Dead Work," because additional yardage prices have to be paid to men who have to work in wet places. If the foreman holds down the price, he either loses his men or has to credit the heading men with more yardage than they have driven. Often concessions for water result in increased yardage prices in wet and dry places alike.

Inefficient drainage at the face necessitates the construction of frequent crosscuts from heading to heading and of driving of the airway backward up the rise, which, where sights are not used, often greatly increases the yardage driven without increasing the territory developed.

If sights are used, the engineer's work is increased and in any event the trackmen's time is wasted laying additional partings and in moving track. As for the surveyor he finds his work less accurate and made far slower by the presence of water and parts of the mine remain unsurveyed because inaccessible.

The health of the live stock is undesirably affected and the charge, "Mule Barn," remains excessively high in a wet mine. The item, "Supplies," is increased because rails, pipe and cars left in water impregnated with sulphuric acid are often only fit for the scrap heap when the water is removed.

And, furthermore, all the other items are affected though not in equal measure or in the same direct manner. For example, fixed charges are distributed over a smaller tonnage, when water disorganizes the mine.

In many cases mine development is so delayed by lack of pumping facilities that the operation fails to produce at any time over 50 per cent. of its rated capacity. The headings are delayed or closed down and even the opened portions of the mine stand idle for lack of adequate means to keep them dry.

Most operators buy pumps only when they feel they *must* have them. They do not keep a sufficient reserve supply on hand though any day a flood breaking through the caved areas may fill the workings with water. An operator may always feel sure that, as his worked-out areas increase, the water to be handled will continuously augment and a pump in excess of present requirements will find plenty of work to do.

Too many are looking for some great scheme to lift their mines from profitless to successful operation. Yet in nine cases out of ten, the need is not for a reconstruction but merely for the following up of the simplest principles of foresight.

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The Widespread Flood

We can all see now the folly of it, of those light frame houses on the riverside destined some day to be engulfed in the river flood and some to be burned while crowded with the very people who lived in and erected them.

Clearly now we view the thoughtlessness which made them raise feeble levees against ever-rising rivers instead of straightening them and giving them greater cleansing qualities than provided by nature. They built their firetrap shells in the floodbed of the waterways and the rivers rose in their might and claimed their own. We all, as a people, have been unwise in granting unrestricted rights up to the river bank without discrimination, to all those claiming the ground bordering on water courses. In many cases, even further encroachments have been permitted.

No coroner's jury will be called, nothing but sympathy will be extended to those unfortunates who are yet living to see the consequences of their mistakes. We hope the disaster, however, will convince them that all distress above the ground and below it, does not argue a real perversion of human nature.

Mine misfortunes, floods, fires, explosions and the like, are the outcome often of a desire for profit and of a hope born of lack of personal experience that some threatened event will never happen.

And this disaster, was it not caused by a desire to save money in buildings that it might be spent on personal adornment and what is known as the American style of living? A little money would have replaced temporary and combustible dwellings and stores with reasonably floodproof, fireproof structures. A few hundreds of dollars would have made each smaller dwelling as resistant as were the French in a recent flood. A reasonable addition to the costs of living would have strengthened dams, dikes and levees and widened streams to meet all requirements.

But the hope existed here also, as in the mines, that the delayed disaster would never come or if it came, that it could be mitigated by energy and decision. It is now we know no time to condemn. It is our duty to see that profit, comfort, ease, luxury and avarice, do not stand between us and the duty of preventing loss of life.

It is true the flood has been unprecedented in severity. Similarly in the mines, not only do problems of unequaled intensity often occur but new phenomena frequently appear which the imagination of the human mind has been totally unable to foresee.

The Individual Operator

How the individual anthracite operator will fare under the changed conditions in the hard-coal trade is a subject of much speculation among the trade. Some are of the opinion that it means a reversal, in part at least, to the conditions in effect previous to 1900, when the coal was sold in the open market in about the same way that bituminous is handled today. Again, there are others who feel that a way will be found to discourage the individual operator from flooding the market with low-priced coal. In any event, a broad change in the basic principles upon which a large industry of this character is built up, offers grave possibilities.

The outlook in the anthracite trade is dull enough at the moment, without being further aggravated by having the independents flood the market with a low-priced product. To those familiar with the conditions of marketing anthracite coal, it is generally conceded that the present method has proved advantageous to both the consumer and the operator. It has induced the buying of coal during the slack season, thus assuring the mines continuous work the year round, and at the same time offering the consumer the opportunity for storing his winter's supply of coal at the lowest quotations in effect at any time during the year.

In addition, it is a well-known fact that the maximum economy of operation cannot be effected by intermittent work at the mines, and the railroad man is free to confess that the transportation facilities of the country are not adequate to meeting the excessive demands which develop at times during the winter. Nor can the railroads afford to provide sufficient equipment for handling this abnormal tonnage, since it would be idle during much of the year.

A plan that has been evolved from years of experience, such as the one referred to, is not to be lightly cast aside without mature consideration. Last fall the individual operators gave ample evidence of their disregard for the companies' circular when they withdrew from selling arrangements of long standing in order to obtain the extra profit that was being freely offered for premium coal. Now that conditions are reversed, these independents are finding it necessary to sell at less than the companies' circular in order to place their product. And even at discounts ranging from 15 to 40c. per ton under the circular, the consumers are not inclined to give them business.

The country will be fairly well stocked by July and August, and it is interesting to consider what steps the independents will take to place their product. It is doubtful if they will, as a rule, put any curtailment policy into effect, and it seems more probable that this period will find them offering large discounts in order to move their long sizes.

It is to be hoped, however, that such will not be the case, as it is obviously as much to the advantage of the independent operator not to force his coal on an unresponsive market, as it is to the larger companies.

He should also recognize that his corporation neighbors have facilities for fulfilling their agreements and a prestige among the consumers that the individual operator can scarcely ever expect to obtain. It is to be hoped that the current year will see the trade moving along in the same channels of other years, and that the individual operator will support to the best of his ability the orderly method of distribution which has meant prosperity to the anthracite industry for the past decade.

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A Mix-Up at St. Louis

The coal industry in and around St. Louis seems to be on the verge of a complete demoralization, with the producers fairly fighting for an existence. The cause is, primarily, a condition of ruinous competition, prices being cut down to, and even below the cost of production, by operators who are determined to keep their mines working at any cost. While instances of overproduction in the bituminous industry, are all too common throughout the country, in this case it has attained most exaggerated proportions.

The trust-busting enthusiast, who has so aggressively demanded the dissolution of the big anthracite combine in the East, would do well to study conditions in the St. Louis market and observe the results where there is a lack of cohesion in the industry. If economic conditions of the country demand that competition be so severe, that company after company is becoming defunct, then the dream of the trust-smasher has been realized in the southern Illinois field.

When overproduction is accompanied by an aggressive campaign among the individual operators to force their competitors into bankruptcy, we must confess that the situation appeals to us as unusual, to say the least.

Everyone knows that it is an expensive proposition to close down a coal mine, and in the case of many of the older operations it is sometimes fatal. Maintenance expenses such as drainage and timbering, continue, regardless of whether the mine be working or idle and, in some operations having a large territory developed, these charges are invariably heavy. And, again, there are other conditions. For example, a mine having a capacity of say, 1600 tons per day, has a contract at $1.02½ to $1.05 per ton for 1000 tons of its production, the cost of producing which is $1 per ton. The best price obtainable in the spot market is 85c. per ton, so that on the face, it appears that the production must be curtailed down to the contract requirements. As a matter of fact, however, operators find that this last 600 tons, which is produced without any additional day men or increase in fixed and running charges, is obtained at a figure which makes it entirely feasible to market it at 85c. per ton in spite of the fact that the average cost of production is 15c. higher. Thus, it is easy to see why odd tonnages of a low-priced coal may occasionally find their way into the market.

This latter condition applies more particularly to the Williamson and Franklin County field. Operators in the Standard field, which comprises the fifth and ninth districts, freely admit that they are losing money and it is difficult to understand why they should persist in the face of such discouraging conditions. The cost of production in this district varies from 85 to 90c. per ton, with a few who can possibly produce at a trifle under this minimum, while the average selling price is only about 75c. a ton.

To further aggravate conditions, the St. Louis Coal Traffic Bureau, made up of all the local coal-carrying roads, has announced a general advance of 5c. a ton into St. Louis. This arbitrary action of the transportation companies is, however, meeting with bitter opposition.

SOCIOLOGICAL DEPARTMENT

The Leisure and Pastimes of the Frick Employee

By Thomas W. Dawson*

SYNOPSIS—The Frick company endeavors to promote healthful sports, providing and maintaining baseball diamonds and making donations for suits and equipment. A swimming pool is provided at Leisenring No. 1. Forty-five playgrounds were constructed in 1912.

The H. C. Frick Coke Co. has built churches of all denominations and encourages the establishing of schools. It coöperates with the school authorities in every possible way, many of its superintendents being members of local school boards.

Sports and recreation of an elevating character are furnished for the young and old, and athletics are encouraged among the young men.

The Frick Baseball League

At every plant there is a baseball team, and all these are in a league with regularly scheduled games. They use the official playing rules of organized baseball, and the winning team at the end of each season receives the Thomas Lynch loving cup as a trophy. Keen rivalry exists among the teams, and public interest in the outcome is well sustained. In the larger towns you will find crowds of people scrutinizing the board which records the scores of the games played by the Frick teams.

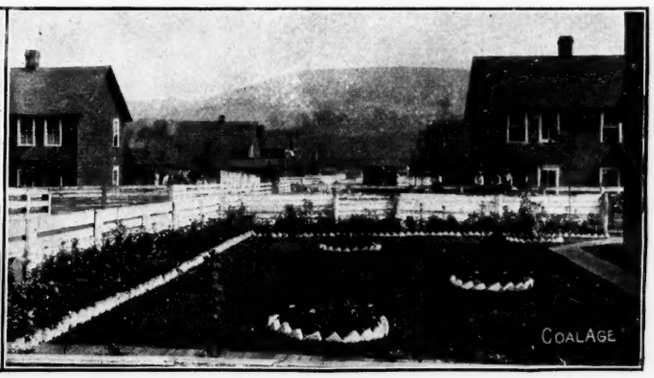
It is doubtful whether any amateur league in the country sustains as many good ball players. All of them are required to work in or about the mines, and only employees who have been in service 30 days immediately before playing are permitted to take part in the league games; furthermore they must be employed at the plant or plants which the club represents.

In 1911, the Leisenring No. 1 ball team won the cup, and in 1912 Edenborn was the victor. The company provides the ball diamond, keeps it in condition, and makes donations for suits and equipment. However, many of the teams are self-supporting, raising money by festivals, picnics and other means. The baseball diamonds are so well constructed and kept that they would do justice to independent municipalities.

The Swimming Pools

The Leisenring No. 1 plant is the first to have a swimming pool, which the company has constructed. It is a rectangular concrete tank, 80 ft. long and 40 ft. wide, and its depth ranges from 30 in. at one end to 7 ft. at the other. Each person using the pool is required to take a shower bath for cleansing purposes; he then dons a bathing suit, before entering the pool. The water is frequently changed so that it is always pure. On certain afternoons the pool is reserved for the exclusive use of women. A competent guard or instructor is in charge of the pool at all times to lend assistance to the bather and see that all rules are complied with.

Park and Playground Provided for the Trotter Youngsters



Lawn and Flowers Which Drew First Prize at Baggaley, Penn.

The Village Greens

In addition to this, tennis courts, croquet greens, parks and playgrounds are provided for all forms of outdoor sport and amusement. They are conducted by organizations overseen by a competent party. Forty-five large and well equipped playgrounds were laid out in 1912. They are equipped with seesaws, flying rings, horizontal bars, roly-polys, dancing pavilions, and the like. In some of the towns, bands made up of employees of the company furnish concert music during the summer evenings. The amusement hall for basket ball, dancing, entertainments, etc., provides exercise and equipment during the winter months.

An employees' bath house has been built at the Collier

*Assistant chief engineer, H. C. Frick Coke Co., Scottdale, Penn.

Note—Abstract from paper entitled "Welfare, H. C. Frick Coke Co.," read before the winter meeting of the Coal Mining Institute of America.

mine as an experiment to see if such an innovation will be appreciated and to educate employees along lines of cleanliness. Workmen leave their clean clothes here during the day, and when they return from the mines at night, they take the shower or bath, as the case may be, leaving the clothes they wore during the day, don clean garments, and are ready for supper as soon as they reach home.

Every Lot Is a Garden or a Lawn

During the summer season, remarkable vegetable and flower gardens and lawns are seen in all the towns owned by the company. The superintendent of each plant is authorized to do the necessary grading, to soil the gardens where good soil does not exist, to fertilize and plow them, and do all he can to assist the employee and teach him how to sow and tend his garden and make a lawn. He is told that every part of his town must be green at the summer season of the year.

It is really remarkable the manner in which the people have interested themselves in the care of their little gardens and lawns, and now little or no persuasion on the part of the superintendent is needed to secure rows of well-kept lots. Cash prizes are offered for the best vegetable and flower gardens and lawns. Committees composed of disinterested parties, doctors, business men, farmers or the civic committees of the nearby towns are called in to award the prizes.

It frequently happens that this committee finds as many as a half dozen gardens, any of which would be entitled to the first prize. In a case of this kind, cash equal to first-prize money is awarded to each. Neatly framed certificates, printed from steel dies, are presented to the owners of the prize vegetable and flower gardens and lawns. These certificates are signed by the various members of the committee awarding the prizes. They bear the name of the owner, the house number, and the name of the mine. Should a prize winner move away from the colliery before these certificates are filled, they are forwarded to him as his property.

In 1912, there were 5150 gardens occupying 72 per cent. of the total area covered by the company-house lots. In 1913, we look for 100 per cent. of them to be cultivated. If we estimate the value of the average garden at $50 (and many of them are worth $75 and $80), we find that last year the employees of the H. C. Frick Coke Co. enriched themselves $257,500 through their gardens alone. Fresh vegetables are usually a scarce commodity, but all the Frick employee has to do is to go out into his little garden and find wholesome food. Should a certain employee be able to cultivate more than the plot of ground allotted to him around his dwelling, the corporation will provide him with land adjacent for cultivation if owned by the company.

Leisenring No. 1 Team, Which Won the Thomas Lynch Cup in 1911

The Early Use of Coal

Probably the earliest mention of the use of coal in the United States is contained in the journal of Father Hennepin, a French missionary who, as early as 1679, reported a "cole" mine on the Illinois River, above Fort Crèvecoeur, near the site of the present city of Ottawa. Coal was not mined in the state of Illinois, however, until 1810, when it was produced in Jackson County, at a point on the Big Muddy River.

Later, coal was found at Fort Duquesne, now Pittsburgh, in 1758, when that frontier post fell into the hands of the English under General Forbes. On Oct. 4, 1770, General Washington, while in Fayette County, Penn., made the following entry in his journal:

> At Capt. Crawford's all day. We went to see a coal mine not far from the house, on the banks of the river. The coal seemed to be of the best kind and burned freely.

The coal mine here referred to was at the site of the present town of New Haven, opposite Connellsville, then known as Stuart's Crossing.

Coal was known to be present in Virginia as early as 1700, though mining did not begin until the latter part of that century. In 1789, shipments were made to some of the Northern states.

It is not known when the anthracite deposits were discovered in Pennsylvania, but in 1776 coal was shipped down the Susquehanna River, from the Wyoming Valley to Harrisburg, and hauled in wagons to Carlisle for use in making firearms.

Wyoming Mining Examinations—Notice has been received from George Blacker, state coal mine inspector, District No. 1, Cumberland, Wyo., stating that the Board of Examiners will meet in Kemmerer, Wyo., Apr. 24, 25 and 26, 1913, to examine those who may desire to take the examintaion for mine foreman and fireboss certificates.

DISCUSSION BY READERS

Post Timbering at the Working Face

Letter No. 11—In my opinion, a miner is the proper person to timber his working face. As all practical miners must admit, a great many difficulties arise in a working place, in a very short time; and as the miner is employed in the same place every day, he is in a better position to know when and where posts are most needed.

I do not think that any systematic method of timbering should be introduced in mines, unless the company is prepared to give their men a particular size and grade of timber that would be suitable in every way for the purpose intended. We can hardly say timbering is being done systematically where we are using timber of various sizes and grades. Say, for ordinary work, the miner is supplied with a number of black-spruce posts, eight inches in diameter, and a number of fir posts of smaller dimension. After a short time the fir posts will be badly broken, while the spruce posts will show scarcely any signs of strain. Under these conditions suppose the posts are to be set six feet apart in every direction, in an endeavor to equalize the weight on every post. If they are not of the same size and grade of timber, it is evident there would soon result a very bad looking place, particularly if the roof was "weighting." The smaller-sized timber of inferior wood would be broken, while the better grades and larger sizes would stand firm.

I claim that every miner should be held reasonably responsible for the proper timbering of his place, and when the foreman is making his usual visits, if the place is not properly timbered he should promptly send the miner out for neglecting a very serious duty.

JOHN A. MCDONALD.

Reserve Mines, Cape Breton, N. S., Canada.

Letter No. 12—In considering the question of timbering at the working face, the safety of life and limb should be of more importance than the cost of the timber. The post plan of timbering, in seams of coal 6 ft. thick or less, is generally found to be efficient; but where the seam is from 8 to 12 ft. thick, with a drawslate over the coal, this plan may have to be modified. It may be, and often is, necessary to modify the general plan of extracting the coal to suit the conditions and to insure safety.

The Miners' Circular, No. 9, published by the Bureau of Mines, pp. 6 and 7, gives four principal causes of accidents from falls, and a table showing the percentage of fatalities at the working face, as compared with those on entries and in pillar workings.

This table suggests to me that the entries of a mine are often more closely inspected and are timbered by more experienced men than the working places, particularly in the anthracite mines, where the number killed at the working face is from six to seven times the number killed on the entries and in pillar workings, although the latter is the most dangerous work. The fact is that miners are too often left to do their own timbering in such manner as they see fit. The posts are set haphazard, according to no particular system. It is true that the percentage of men killed at the working face would naturally be larger on account of more men being employed there, representing a larger number of working hours than is true for the entries or gangways in the mine.

In this connection, I want to state that the second largest producing mine in the state of Montana has adopted a systematic division of the entire work. Machine operators are employed to undercut the coal, by contract; drillers are employed to drill the holes, by contract, power drills being used; the coal is loaded by loaders working on contract. The company employs shotfirers to tap and fire all holes; trackmen are employed to lay all tracks and switches, and timbermen are employed to set all timbers. The seam of coal is from 6 to 10 ft. thick, there being from 1 to 3 ft. of drawslate between the coal and solid roof.

As a result of such a systematic division of the work, this company reports a less number of accidents per thousand men employed, and a greater tonnage or output per fatal accident and, I believe, a larger percentage of coal won, than in most mines in this state. If the plan works well in this mine, why not adopt a similar six-department plan in all mines? The work is better done, track is better laid, which makes hauling easier; timbers are better set, which reduces the number of accidents; and the machinemen, drillers and shotfirers all perform their work with less trouble and better results.

In such a system, if there is any fault to be found, the coal broken too fine, timbers not set right, or cars frequently derailed, a word from the foreman to the man in charge of that work is sufficient to remedy the trouble. Furthermore, machinemen, drillers, shotfirers, trackmen and timbermen all get more experience in their particular line of work and better results are obtained.

Answering, briefly, some of the questions asked in the outline, Feb. 22, p. 286, I would say: The province of a mine post is to indicate the condition of the roof and uphold the roof slate; rather than to sustain any great amount of weight due to the overburden, which must rest on the pillars. Posts should be set as quickly as the working face is advanced 4 or 5 ft., not more; a less distance would be better under many conditions. The posts should be set perpendicular in a flat seam; but when the seam is inclined, they should lean a little up hill from the normal position in the seam. The advantage to be derived from a systematic system of timbering is that the roof has less chance to move or draw and there is greater protection against a chance slip or fault line in the roof.

I believe, however, special timbermen should be employed for the work, as they become more experienced and better results are obtained. An experienced forester, in this locality, when asked in regard to the cutting, storing and preserving of mine timber, notwithstanding his knowledge of the present practice in mines, advised that mine timber should be cut when the sap is up, say from June to September, claiming that the bark is more easily removed, which should be done, and that the timber sea-

sons better, and the wood is stronger than when the timber is cut in midwinter, when the sap is down. The wood then, he states, is harder to work, drier and more brittle.

He also advises storing mine timber in horizontal layers rather than standing the same on end. Strips or slats should be laid between each layer to allow the air to circulate. He advises treating mine timber with creosote or a zinc preparation to preserve it and prevent fungus growth.

J. B. McDERMOTT,
Chief Mine Inspector.

Helena, Mont.

Utilization of Abandoned Mines

I have seen references, from time to time, in COAL AGE, to the question of developing power directly from the coal, in mines, according to the suggestion of Sir William Ramsay. It seems to me that practical use will be made of this suggestion some time, and why not now? It has occurred to me, in this connection, that the large abandoned coal areas that have been worked out could be utilized for the purpose of testing this method for the development of power.

There are right here in western Pennsylvania, large areas, containing several thousand acres of coal land, the coal of which has been worked out and the mines abandoned. These coal fields originally belonged to Jones & Laughlin and the H. C. Frick Coke Co. and were long ago entirely exhausted. The field forms a triangle extending from Broad Ford to Dawson; and, bounded on the north by Jacobs Creek, reaches almost to Scottdale. There are similar abandoned fields near here, Smithdale.

It seems to me that these abandoned fields would form an excellent opportunity for making the proposed experiment. The Jacobs Creek field is on fire, already, in two places. As I understand the suggestion, all that would be required to try out the method would be to close the mine openings and sink drill holes at suitable points for the introduction of air sufficient for the partial combustion of the coal remaining in the mine. Other holes would then have to be drilled and cased and connected with pipe lines that would carry the gas from the mine in which it is generated, to the several points where it is to be used, say Connellsville, Scottdale and other places. I believe this question should be brought to the attention of men who have the capital necessary to carry forward the project.

E. KRAUSE, Mine Foreman,
Forest Hill Mine, Pittsburgh Coal Co.

Smithdale, Penn.

[While the suggestion of Sir William Ramsay, regarding the development of power directly from coal in place, has a practical bearing and appeals to men in the sense that it would eliminate the dangers incident to the mining of the coal, the proposition has not as yet been reduced to a practical basis. The suggestion of piping sufficient air into old abandoned workings to insure the partial combustion of the coal and the generation thereby of combustible gas that could be piped to the surface and distributed to the points where it is to be used, presents a danger that might eclipse the present dangers of coal mining.

Briefly, the probable dangers are: (1) The generation of large quantities of poisonous gases from underground fires, which, under the conditions that would naturally exist, could not be retained in the mine and in the pipe system, owing to the rupture and crevicing of the overlying strata and frequent breaking of the pipeline. (2) The surface damage that would result both from the subsidence of the strata as the coal is burned out, and from the heat of the underground fire, which in some cases would destroy vegetation. These dangers are of such a nature as to hold the proposition in abeyance until some method of converting the energy of the coal into available power is devised that would not entail risks greater than what now invest the industry.—ED.].

An Echo of the Discussion—Reducing Ventilation When Firing

With the consent of the director of the Bureau of Mines, we publish the following excerpt from the report of the chief engineer of the bureau, to whom the matter of conducting a series of experimental tests in the Bruceton mine belonging to and operated by the federal government for the sole purpose of experiment and investigation, was referred.

Several of the contributors who took part in the February discussion, in COAL AGE—Reducing Ventilation When Firing in Mines—made the suggestion that the federal government should be asked to conduct such experiments, at their testing station, as would throw some light on the question discussed. In response to these requests, the director of the Bureau of Mines referred the matter to his chief engineer who reported in part as follows:

> The problem of the effect of the movement of air in a mine at the time of shotfiring has been one of the features of investigation at the experimental mine. Owing to the lack of sufficient funds these tests have been suspended, and, therefore, the bureau is not in position to make any authoritative statements, and will not be until the tests have been resumed this coming fiscal year.
>
> It may be pointed out, however, that in the few tests that have been made in which there has been a variation in the air current, that this variation appears to have no effect on the initiation of a dust explosion; a number of tests were made with the air intaking toward the initiating shot, and in several other tests the air was returning from the point of the initiating shot; there was no appreciable difference in the results of the initiating shots. Explosions of dust resulted under both conditions, although other variations prevented drawing conclusions as to whether the explosion was more violent in the one case than in the other. In the last explosion test, which was a very violent one, the maximum pressures being 115 lb. per square inch, the initiating shots were fired in a perfectly quiet atmosphere; all the crosscuts being closed by stoppings.
>
> From these tests the chief mining engineer gives his personal opinion that the movement or nonmovement of the air is of relatively small importance in the initiation of a dust explosion; although it is quite plausible that in the propagation of a dust explosion, where the dust has been thrown up into suspension by previous shots, that the chances of a continued explosion are greatly increased by a strong air current.
>
> The influence of the composition of the atmosphere in a mine prior to an explosion is another matter, and no large-scale tests have yet been made at the experimental mine, or so far as known in the foreign experimental galleries. From the laboratory tests it does not appear that the presence of small quantities of carbon dioxide have any appreciable effect on either a gas or dust explosion, but the amount of oxygen present is all important. This, however, is yet to be demonstrated on a large scale.

While there was much diversity of opinion manifest in the discussion of this important subject, the point was brought out and the fact quite definitely established that there are conditions existing in some coal mines that

make it safer to fire shots in still air, in the mine, than when the air is sweeping the face with more or less velocity.

Just how far, if at all, the suggestion of reducing the ventilation when firing, or closing the upcast shaft can be applied with safety or advantage, under the varied conditions of coal mining, is yet to be determined.

We note with pleasure the willingness of the Bureau of Mines to look further into the matter and ascertain if possible, the true bearing of the facts brought out in the discussion of the question in COAL AGE. We desire to draw the attention of the bureau to the offer of Mr. Waterman, Genl. Supt. of the Fleming Coal Co., Pittsburg, Kan. (COAL AGE, Feb. 22, p. 311), to assist representatives of the Bureau of Mines "to obtain samples of the air in mines where the fan is entirely stopped for from 30 min. to 1 hr. before firing shots."—Ed.

Textbooks in Mining Examinations

I would like to say a word in reference to your editorial, A Good Suggestion, Mar. 22, p. 456, urging the free use of textbooks, by candidates, in mining examinations. I think every man who takes the examination should possess the ability to answer the questions asked by the examining board, independently. I am in favor, however, of the board giving the proper formula with each question. There is no reason why any man who has the ambition to learn and will take the time to study cannot equip himself properly. The reason why so many applicants fail to pass the examination is because they do not get down to study until the time comes to take the examination.

Many mine foremen who have passed a successful examination set their books aside as soon as the examination is over, and, as a result, they are as far behind today as ever. I would not say that all men who pass do this, but I think it would be safe to say that 60 per cent. of the successful candidates in mine foremen examinations never look at their books after the examination is over.

Study is important in order to keep up with progress, and every mine foreman must continue to study new systems of mining if he would be successful. To give up study is to go back; therefore, I believe in hard study, and I believe the present system of examining applicants for mine foremen should be continued. Also, I think that every mine foreman should be examined again, once in four years. If this plan was followed out, and men would study, I do not think there would be any need for using textbooks in the examination.

WM. K. RAY, Mine Foreman,
Quemahoning Coal Co.

Ralphton, Penn.

Study Course in Coal Mining

BY J. T. BEARD

The Coal Age Pocket Book

FLOW OF WATER

Water, like all fluids, assumes a level surface when at rest; and, conversely, a difference of level causes water to flow from a higher toward a lower point, in obedience to the law of gravity. The theoretical velocity of the flow is the same as that of a body falling through the same vertical height, as determined by the formula,

$$v = \sqrt{2gh}$$

in which v = velocity (ft. per sec.); h = height of fall (ft.); and g = force of gravity (32.16 ft. per sec.).

FLOW OF WATER IN DITCHES

The flow of water in a ditch or pipe, like the flow of air in an airway, is impeded by the friction of the sides or the rubbing surface of the conduit. The formulas for calculating the velocity and quantity of water flowing in a ditch are identical with the same formulas, in mine ventilation, for finding the velocity and quantity of air flowing in an airway, except that the flow of air is expressed in terms of the pressure p, while the flow of water is expressed in terms of the "head" or vertical height h through which the water falls.

Mean Velocity of Stream—Let v = mean velocity of water flowing in a ditch; h = head or vertical fall (ft.) in a distance l (ft.); o = wet perimeter of ditch, in feet; a = area of cross-section of the water; and c is a coefficient expressing the resistance offered by a unit of rubbing surface (1 sq.ft.) to a current having a unit velocity (1 ft. per sec.). Then

$$v = \sqrt{\frac{h}{cl}\frac{a}{o}}$$

In calculating the flow of streams and water in flumes and ditches; $s = \frac{h}{l}$ = slope or grade of ditch, and $r = \frac{a}{o}$ is called the hydraulic radius; and the formula for the mean velocity may then be written

$$v = c_1\sqrt{sr}$$

Following are values of c, for different kinds of material lining the channel and different values of the hydraulic radius:

	Value of c_1 for Different Values of the Hydraulic Radius, $r = \frac{a}{o}$								
Kind of Channel Bed	0.25	0.50	1	2	3	5	10	25	50
Smooth cement lined.....	125	135	141	144	145	146	147	148	148
Smooth brick lined.....	95	110	119	124	126	128	130	131	131
Rough rubble masonry.....	57	72	87	98	104	108	112	115	116
Rough earth bed.....	26	36	48	62	70	80	91	100	104
Very rough rocky bed.....	18	25	35	46	53	62	72	81	86

The Coal Age Pocket Book

Example—Find the mean velocity of the water flowing in a ditch that measures 10 ft. wide onthe surface, 6.4 ft. on the bottom, the water being 3 ft. deep. The ditch is fairly smooth, brick lined, and has a fall of 4 in. per 100 lb.

Solution—The area of cross-section of water is a = 3 (10 + 6.4) ÷ 2 = 24.6 sq.ft. The length of each sloping side is $\sqrt{3^2 + \left(\frac{10 - 6.4}{2}\right)^2} = 3.5$ ft. The wet perimeter is then 2 × 3.5 + 6.4 = 13.4 ft. The hydraulic radius is therefore, $r = \frac{a}{o} = \frac{24.6}{13.4} = 1.8$. The slope is $\frac{4}{100 \times 12} = \frac{1}{300}$. The value of the constant taken from the table above, for a brick-lined channel, having a hydraulic radius r = 1.8, is $c_1 = 123$. Then the mean velocity is

$$v = c_1\sqrt{sr} = 123\sqrt{\frac{1}{300} \times 1.8} = 9.6 \text{ ft. per sec.}$$

FLOW OF WATER IN PIPES

Gravity Or Pressure Head—The flow of water in a pipe line is caused by a certain "head," which is the vertical distance of the point of discharge below the surface of the water in the supply basin or reservoir. This head causing the flow is called the "gravity head" or the "pressure head."

Friction Head and Velocity Head—The gravity head is wholly absorbed or taken up in overcoming the friction of the water in the pipe and in producing the velocity. That portion absorbed by the friction is called the "friction head," and that producing the velocity, the "velocity head." Each of these heads depends on the quantity of water discharged per minute and the diameter of the pipe and the friction head, further, depends on the length of the pipe line. The formulas follow:

Friction head, $h_f = \frac{lG^2}{800\,d^5}$

Velocity head, $h_v = 0.0026\frac{G^2}{d^4}$

in which, h_f = friction head (ft.); h_v = velocity head (ft.); l = length of pipe line (ft.); d = diameter of pipe (in.); and G = quantity of water discharged (gal. per min.).

Example—Find the friction head and the velocity head in a 6-in. pipe line 5000 ft. long, discharging 700 gal. per min.

Solution—Substituting values in the formulas above:

Friction head, $h_f = \frac{5000 \times 700^2}{800 \times 6^5} = 394$ ft.

Velocity head, $h_v = 0.0026\frac{700^2}{6^4} = 0.93$, *say* 1 ft.

INQUIRIES OF GENERAL INTEREST

Calculating the Flow of Water in a Siphon

I have taken the following formula from a textbook of W. Wardle and have been told that it is approximately correct as expressing the flow of water through a siphon, in cubic feet per min. As the formula is a simple one, I would like to ask if it is correct. The formula is as follows:

$$Q = \sqrt{\frac{d^5 h}{l}} \times 4.71 \ (cu.ft.\ per\ min.)$$

A. L.

Gastonville, Penn.

The above formula, in many cases, is only approximately correct. It errs, first, in giving too high a value for the constant, 4.71, which is only adapted to pipes of a comparatively smoth bore. Under ordinary mining conditions, the pipes become more or less obstructed by corrosion due to the acid nature of the mine water. On this account, the constant 4.71 should be 3.78, in order to adapt the formula to mining conditions.

Again, the formula is deficient, for general application, because it takes no account of the velocity head, which is the head absorbed in creating the velocity of the water in the pipe. For a low velocity, the pressure or head absorbed in producing the velocity is small and may be disregarded. At other times, however, for higher velocities or when greater accuracy is desired, it is important to allow for the velocity head, in addition to the friction head. Making this allowance for the velocity head, the formula becomes, expressing the flow in cubic feet per minute, or in gallons per minute, as desired,

$$Q = 3.78 \sqrt{\frac{d^5 h}{l}} = 3.78\, d^2 \sqrt{\frac{dh}{l}} \ (cu.ft.\ per\ min.)$$

or

$$G = \sqrt{\frac{800\, d^5 h}{l}} = 28.28\, d^2 \sqrt{\frac{dh}{l}} \ (gal.\ per\ min.)$$

These formulas express correctly the flow of water in a siphon, under mining conditions, taking the coefficient of friction for the flow of water in the pipe as 0.01, which conforms closely to mining practice. If the siphon has a rise h_1 and a fall h_2, the effective head producing the flow is $h = h_2 - h_1$.

The formula given by our correspondent, even correcting the constant and using 3.78 instead of 4.71, will still give too high results, in many cases where the velocity in the pipes is great. The percentage of error, in the use of that formula, will vary with the ratio of the diameter of the pipe, in inches, to the entire length of the pipe, in feet. The percentage of error is practically equal to the ratio of the diameter of the pipe, in inches, to the length of the pipe, expressed in hundreds of feet. Thus, for a 1-in. pipe 200 ft. long, or a 4-in. pipe 800 ft. long, or a 6-in. pipe 1200 ft. long, this ratio is $\frac{1}{2}$, and the percentage of error, in the use of the first formula, is one-half of one per cent. Again, for a 1-in. pipe 100 ft. long, a 2-in. pipe 200 ft. long, or a 6-in. pipe 600 ft. long, etc., the ratio is 1 and the percentage of error, in this case, is 1 per cent.

Suppose, for example, it is desired to ascertain the flow of water in a 4-in. siphon, having a rise of 12 ft. in 60 ft., followed by a fall of 24 ft. in 900 ft. The entire length of the pipe is 960 ft. The effective head, in this case, is $24 - 12 = 12$ ft. This question was submitted by G. H., Johnstown, Penn. In this case, the ratio of the diameter of the pipe, in inches, to the length of pipe expressed in hundreds of feet, is $\frac{4}{9.6} = 0.416$; and therefore, in this case, there is less than one-half of 1 per cent. of error in disregarding the velocity head and using the first formula with the corrected constant. Making the calculation by this formula the quantity of water this siphon will deliver, since $h_2 - h_1 = 24 - 12 = 12$ ft., disregarding the velocity head, which in this case is only 2.58 ft. per sec., is

$$Q = 3.78 \times 4^2 \sqrt{\frac{4 \times 12}{960}} = 13.5\ cu.ft.\ per\ min.$$

Or,

$$G = 28.28 \times 4^2 \sqrt{\frac{4 \times 12}{960}} = 101.2\ gal.\ per\ min.$$

In this case, using the second formula, allowing for velocity head, the flow of water in the siphon is 100.7 gal. per min., instead of 101.2 gal. per min., which is a reduction of $101.2 - 100.7 = 0.5$ gal., or less than one-half of 1 per cent.

We will now take a case in which the loss, by using the first formula and disregarding the velocity head, will equal at least 2.5 per cent. For example, find the discharge of a 4-in. siphon, which has a rise of 12 ft. in 60 and a fall of 20 ft. in 100. This siphon will work properly, because

$$\frac{34 - 12}{2.08 \times 4 + 60} \ is\ greater\ than \ \frac{20 - 12}{2.08 \times 4 + 100}$$

(Coal Age, Vol. 1, p. 386).

The discharge of this siphon, in gallons per minute, calculated by the approximate formula, first, and then by the corrected formula, is as follows:

$$G = 28.28\, d^2 \sqrt{\frac{d\,(h_2 - h_1)}{l}}$$

$$= 28.28 \times 4^2 \sqrt{\frac{4\,(20 - 12)}{160}} = 202.3$$

Again,

$$G = 28.28\, d^2 \sqrt{\frac{d\,(h_2 - h_1)}{2.08\, d + l}}$$

$$= 28.28 \times 4^2 \sqrt{\frac{4\,(20 - 12)}{2.08 \times 4 + 160}} = 197.3$$

The difference in the results obtained in the use of these two formulas amounts to 5 gal. per min., showing an error of 2.5 per cent. in the use of the first formula.

EXAMINATION QUESTIONS

Drainage and Pumping

Ques.—Knowing the head of water, in any case, how is the pressure, in pounds per square foot and pounds per square inch, calculated?

Ans.—Since the weight of 1 cu.ft. of water is 62.5 lb., the pressure, in pounds per square foot, is found by multiplying the head in feet, by this weight. Thus, the pressure due to a head of 100 ft. of water is $100 \times 62.5 = 6250$ lb. per sq.ft.

The weight of a prism of water having a base of 1 sq.in. and a height of 1 ft. is 0.434 lb. Therefore, the pressure due to a head of 100 ft. of water is $100 \times 0.434 = 43.4$ lb. per sq.in. The pressure must always be expressed in the same units of measurement as the head.

Ques.—What is meant by "friction head," in the flow of a fluid in a conduit?

Ans.—The friction caused by the flow of water through a pipe or of air in an airway must be overcome by pressure, in order to allow the water to flow. This pressure expressed in water column, in pumping, is called the friction head.

Ques.—What is the "velocity head" in pumping?

Ans.—The velocity head is that portion of the actual head that is absorbed in producing the velocity of the flow. Except in small pipes and high velocities, the velocity head may be disregarded. When, however, a large quantity of water is discharged through a small pipe, a high velocity is produced, which represents a considerable portion of the head or pressure producing the flow. In such case, it is necessary to consider the velocity head.

Ques.—In pumping, in a shaft 500 ft. deep, what is the pressure on the piston of the pump, due to the depth of the shaft?

Ans.—The pressure due to the depth of the shaft, in this case, is $500 \times 0.434 = 217$ lb. per sq.in.

Ques.—If it is required to discharge 250 gal. per min. through a 4-in. column pipe, in this shaft, what will be the total pressure against which the pump must operate, disregarding the friction of the valves, and, likewise, disregarding the velocity head, which, in this case, is small.

Ans.—Before calculating the pressure due to pumping in a shaft, it is necessary to calculate the friction head, or the additional head due to the friction of the water in the column pipe; and this must be added to the depth of the shaft, in order to obtain the actual head against which the pump is operating. When 250 gal. of water are discharged through a pipe 4 in. in diameter and 500 ft. long, under usual mining conditions, the friction head due to the flow of water through the pipe is

$$hf = \frac{l G^2}{800\, d^5} = \frac{500 \times 250^2}{800 \times 4^5} = 38 + ft.$$

Then adding this friction head to the depth of the shaft the actual head against which the pump is operating is $500 + 38 = 538$ ft.; and the pressure on the piston of the pump is then $538 \times 0.434 = 233.5$ lb. per sq.in.

Ques.—Find the size of pump that will be required to discharge 300 gal. per min., from a shaft 200 ft. deep. Give the size of suction and column pipes. Assume a steam pressure of 80 lb. per sq.in. at the throttle of the pump and a piston speed $S = 100$ ft. per min.

Ans.—The diameters of the suction and discharge pipes, respectively, are as follows:

Suction, $d = 0.35 \sqrt{G} = 0.35 \sqrt{300} = 6.06$, *say* 6 *in.*

Discharge, $d = 0.25 \sqrt{G} = 0.25 \sqrt{300} = 4.33$, *say* 5 *in.*

Calling the entire depth of the shaft, including suction and discharge, 225 ft., it is first necessary to find the additional friction head due to the flow of water through the suction and discharge pipes, calling each of these 5 in., for the purpose of calculation. For a flow of 300 gal. per min., through a 5-in. pipe 225 ft. long, the friction head is

$$hf = \frac{l G^2}{800\, d^5} = \frac{225 \times 300^2}{800 \times 5^5} = 8 + ft.$$

The total head against which this pump operates is therefore $225 + 8 = 233$ ft. The diameter d of the water end of the pump is calculated thus:

$$d = 5.37 \sqrt{\frac{G}{S}} = 5.37 \sqrt{\frac{300}{100}} = 9.3, \text{ say } 10\ in.$$

Having found the diameter of the water end, $d = 10$ in., the diameter D of the steam end, for a head of 233 ft. and an available steam pressure of 80 lb. per sq.in., is calculated thus:

$$D = 0.7\, d \sqrt{\frac{h}{p}} = 0.7 \times 10 \sqrt{\frac{233}{80}} = 11.9, \text{ say } 12\ in.$$

In this formula, we have assumed an efficiency of 85 per cent. in the water end and 75 per cent. in the steam end, which is usual pumping practice. Taking the length of the stroke as 16 in., for a piston speed of 100 ft. per min., the pump is running at a speed of $100 \times 12 \div 16 = 75$ strokes per min. The pump required, in this case, is, therefore, a duplex, direct-acting pump 12x10x16 in., the steam cylinder being 12x16 in. and the pump cylinder 10x16 in.

Ques.—At what speed should a pump be driven to insure safety, continuous service, and economy of operation?

Ans.—The safe piston speed of a pump will depend on the style of pump and the service for which it is designed; namely, the quantity of water required to be discharged and the vertical lift of the pump. Under ordinary mining conditions, pumps are designed to make from 50 to 150 strokes per min., according to the style and size of the pump. A pump having a 6- or 8-in. stroke may make 150 or 160 strokes per min., while a pump having a longer stroke, say 2 or 3 ft. or more, is commonly designed for 30, 40 or 50 strokes per min. In usual mining practice, the piston speed varies from 75 to 100 ft. per minute.

COAL AND COKE NEWS

Washington, D. C.

The Interstate Commerce Commission has handed down an important decision regarding the rates on coal from Western Kentucky and Alabama mines to Memphis, Tenn., and points taking Memphis rates. This is the case of the Memphis freight bureau versus the Louisville & Nashville R.R. Co. In substance the Commission holds that a rate of $1.10 from the Kentucky and Alabama mines to Memphis is not unreasonable and it therefore dismisses the complaint. In summarizing the Southern coal situation as exhibited by this case, the Commision says:

Many comparisons were made by defendants with rates from Western Kentucky and Alabama mines to stations intermediate to Memphis, in all of which instances the intermediate rates were higher. On the Louisville & Nashville the maximum is $1.50; on the Frisco, $1.25. As the Frisco is the short line and as water competition cannot be held responsible for the Memphis rate, there is little probative force in the Frisco comparison and but little more in the $1.50 rate on the Louisville & Nashville, which, with 67.3 per cent. of the total rail coal tonnage to Memphis for the year 1910-11, experiences little discomfiture by reason of the 4.85 per cent. handled by the Frisco, and is not seriously disturbed on account of the 24.93 per cent. transported by the Illinois Central. However, compared with other coal rates in the Southeast, the $1.10 rate does not appear to be too high. For example, the rate from Alabama mines to Atlanta, Ga., 168 miles, is $1.20; to Meridian, Miss., 177 miles, $1.10; to Chattanooga, Tenn., 167 miles, $1.10; from Illinois Central mines in Kentucky to Jackson, Tenn., 207 miles, $1.20.

Coke Rates Are Upheld

In another coal decision—that of the St. Louis Blast Furnace Co. versus the Louisville & Nashville, the C. & O. Ry. Co., etc.—and in sundry allied cases, the Commission has ruled that the charges imposed upon shipments of coke from the Virginia, West Virginia and Pennsylvania fields to Missouri are not unduly high and should be sustained in consequence.

In reaching the conclusion thus indicated, the Commission notes that the essential claim is that the rate of $2.80 per ton is unjust and that it discriminates against the city of St. Louis. As to this the point is made that very little testimony was presented in behalf of the complainant in support of the contention that the rate of $2.80 per net ton charged for the transportation of the coke from the various ovens to the furnace was unreasonable, discriminatory, and prejudicial.

The existence of dual rates on coke, whereby blast furnaces at other points, particularly Chicago and other lake ports, enjoyed lower rates on coke intended for their use was alleged in the complaints and admitted by some of the defendants as relating to the time covered by the shipments in question, though it appears that following the condemnation of such rates in the Anaconda case, 19 I. C. C., 592, they were canceled, at least so far as concerns the defendants in the present cases.

Further Anthracite Regulation Anticipated

It is understood that in view of the facts regarding the cost of production of anthracite coal that have been brought to the attention of Congress in the report on the production and prices of anthracite coal lately issued by the Department of Commerce & Labor it is probable that an attempt will be made at the forthcoming session to secure further regulation of the rates charged for the transportation of coal from the mines to points of sale. This may be done through further legislation designed to improve the commodities clause of the Interstate Commerce law. The attention of legislators is being directed to that portion of the coal report in which this subject is discussed and which says in part:

Where there is a common control of the coal mines and railroads (as in all the companies included in this report), the capital invested derives its income from both the mining and transportation of the coal, and the failure to realize profits in mining may be, and often is, compensated by the profits in the operation of the railroad on account of the coal tonnage. In such a case it is not a matter of importance to the controlling financial interests whether the profits are derived from the mining or from the transportation. The purpose is simply to operate the coal mines and the railroad so as to produce the maximum profit from both together and not simply to secure profitable results from each source of income separately.

Under these conditions the motives to increase the efficiency and decrease the cost of mining coal are much weaker than in the case of a corporation dependent for its profits entirely on the results of its mining.

Furthermore, where there is a joint control of the mines and the railroad, and where the failure to realize profits on mining can be compensated by the profit in the transportation of coal over the railroad it might well be advantageous in order to secure all the coal that could be profitably hauled to market to operate at a loss certain collieries that could not be worked independently of the railroad support.

PENNSYLVANIA

Anthracite

Scranton—More than 1200 employees at No. 1 and No. 2 collieries of Jermyn & Co. at Old Forge have gone on strike because of the refusal of about 20 of their number to join the miners' organization. The plants are completely tied up. The strike of the employees at No. 14 colliery of the Pennsylvania Coal Co. at Hilldale has been settled and the men have returned to work.

Wilkes-Barre—Officials of the Lehigh & Wilkes-Barre Coal Co. at Wanamie have not come to any agreement with their employees and the result is that over 900 men and boys are still on strike.

Pottsville—The six miners who were entombed at Buck Run Colliery at Mt. Pleasant, worked their way to the surface through a forgotten airway, greatly surprising the rescuing party, two members of which had been killed while at work. Every man was not only active, but well.

The flooded condition of the Susquehanna and Lackawanna Rivers has caused the closing down of several mines in the valleys of those two streams. All collieries in Plymouth were closed, with the exception of those belonging to the D. & H. Co., and the washeries of the Gaylord and Dodson collieries. Of the collieries operated by the Susquehanna Coal Co., the Glen Dyon, Richards and William Penn collieries were obliged to suspend operations, the latter two owing to the fact that the surface water was entering the workings. The water from the Susquehanna entered the old workings of the Enterprise colliery of the Lehigh Valley Coal Co., and operations were suspended in the Henry Colliery, adjoining the Enterprise.

Bituminous

Stoneboro—The engine and boiler house of mine No. 7 of the Mercer Iron & Coal Co. has recently burned to the ground and the tipple badly damaged. Two hundred men are idle as a result of the fire, but a large force is at work making the necessary repairs. Mine No. 7 is one of the largest in the county and has a daily output of 1600 tons. The origin of the fire is not known.

Punxsutawney—Trouble still exists between the miners and operators at the Eriton shaft at Du Bois. The men quit work Feb. 10 because the company refused to repair the tipple and make the pan self cleaning. For the past three weeks the company has been repairing the workings, especially at the bottom of the mine. Last week a crew started work on the tipple.

Du Bois—The miners of the Buffalo & Susquehanna Coal Co. Shaft No. 2 struck Mar. 25 because J. E. Brown was discharged. This man had been a regular employee for some time. He obtained permission to lay off for a period, desiring to go to Harrisburg to argue in favor of certain labor bills. On his return he did not immediately return to work and when he did attempt to resume work he was not permitted to do so. The strike has been declared off and the men returned to work Mar. 29 pending a settlement by agreement or arbitration.

WEST VIRGINIA

Fairmount—Lake coal shipments from Fairmont regions have been stopped and the local mines cut out of much work by an embargo placed by the Baltimore & Ohio R.R. The destruction of the track and of railroad equipment by the flood were the reasons for the order which will cause the local regions to go on about half time for a week or more.

Charleston—John P. White, president of the United Mine Workers of America, held a lengthy conference with H. G. Hatfield, governor of West Virginia, recently during which he handed the governor a letter containing various demands

of the mine workers. The changes demanded in this letter were as follows: That no discrimination should be made against mine workers for joining an organization, and that all employees should return to work. The establishment of a nine-hour day applying to all classes of labor. A semi-monthly pay-day should be established. The miners at any one mine shall be accorded the right to select a check weighman, and the ton shall consist of 2000 lb. That a joint commission shall be established, and also a board of arbitration.

The fan house of the Paint Creek Collieries Co.'s Scranton mine near Mucklow was destroyed by fire recently. The fan was put out of commission and the coal took fire and burned to a distance of 300 ft. back from the fan mouth. Forty men were at work in the mine at the time, but all escaped without serious injury. The mine has been operated by nonunion labor since the middle of last April. The loss is approximately $2000.

Bluefield—As a result of the conference held by the mine owners and their superintendents in the New River and Virginia district, a nine-hour day will be inaugurated Apr. 1. About half of the mines will also adopt a two-weeks' pay-day. Many of the miners do not approve of the two-weeks' pay-day as they claim they can save more money if paid only once a month.

ALABAMA

Indio—One miner is dead and three seriously burned as a result of a gas explosion in the Indio mines. The mine was closed down following the accident. The explosion is said to have occurred when a naked light ignited the gas. The mine is operated by the De Soto Mining Co.

TENNESSEE

Chattanooga—According to a statement issued by C. E. Buck, the merger which has been pending for several months relative to the amalgamation of the City Gas Co., the Durham Coal & Iron Co., and other mineral and coal interests in this immediate section has completely failed and all negotiations are now broken off.

OHIO

St. Clairsville—Six hundred miners in the Provident mine of the Provident Coal Co. have struck, claiming that the scales used by the company are not correct, and that they are being cheated out of many tons of coal every day. The miners have asked the state authorities to examine the scales.

Massillon—Workmen are making great efforts to recover the bodies which are believed to have been buried under the wreckage of the Malcom Mining Co.'s main building when it was destroyed by a fire and gas explosion. Five bodies have been recovered and many more are believed to be under the ruins. The property loss is $100,000.

Columbus—The Thomas resolution providing for the naming of a commission by Governor Cox to investigate conditions surrounding the mining business in Ohio with especial reference to the scale of wages paid was passed by the house by a vote of 61 to 49. The resolution seeks to delay action on the Green anti-screen bill which was passed by the Ohio senate and which is now pending in the House of Representatives. The commision will be named at once and is to report at the extraordinary session of the General Assembly called to meet during the fall or early winter.

Stillwater—Fire recently destroyed the engine house at the new shaft of the Stillwater Coal Mining Co. The origin of the blaze is unknown and the loss has not been estimated. As a result of the fire, which damaged the hoisting engine, the mine has been closed down until repairs can be made.

INDIANA

Bicknell—The Indian Creek Coal Mining Co., hoisted from their shaft mine on Mar. 10, 3103 tons. This mine is gradually increasing its output.

ILLINOIS

Herrin—The Southern Illinois Coal & Coke Co. has brought suit in the United States Court for $500,000 damages against the Illinois Central R.R. on account of failure of the railroad to provide cars to ship coal, between August 1909 and the present date. It is alleged that the railroad favored certain mining companies in the distribution of cars, and damages are claimed under an Illinois statute, requiring the railroads to furnish cars to persons demanding them for the transportation of coal.

De Soto—The State Mine Inspector has closed down the mine of the J. B. Kreikemeier Coal Co., on account of the failure of the mining company to provide its miners with a sufficient amount of air. It is probable that the mine will be closed down for several months.

IOWA

Eldon—A bad fire is raging in the mine belonging to the Anchor Coal Co. at Laddsdale. All operations are suspended. The mine has been in operation for 45 years. It is likely that the 50 men who are thrown out of employment will have to move to other places. The loss to the men is placed at $500, while the company's loss is hard to estimate.

Knoxville—A bed of coal 5 ft. 7 in. thick, has been found within less than 14 blocks of the court house. This is the result of the extensive prospecting work which is being done by Geo. H. Ramsey.

SOUTH DAKOTA

The Interstate Commerce Commission has ordered an inquiry into carload coal rates from producing fields in Wyoming and Montana to South Dakota points. These rates have been the subject of much complaint to the commission, and it has begun an investigation on its own motion. All leading roads in the three states are defendants.

NEVADA

Goldfield—H. A. Darm, who has been developing coal near Coaldale, in this county, has received notice from Washington that the coal land that he has sought to secure by location and purchase has been re-opened to entry. This land was withdrawn sometime ago by presidential order.

ARKANSAS

Russellville—The Russellville anthracite coal mines are in operation after having been idle for more than two years This property is one of the largest in this section, and is owned by Detroit capitalists.

OKLAHOMA

McCurtain—Three hundred and twenty-six miners were thrown out of work when mines Nos. 1 and 3 of the Sans-Bois Coal Co. were shut down. The mines have been thoroughly cleaned and all tools removed, indicating that the shutdown will be for a considerable period.

McAllister—It is rumored that because the Oklahoma legislature repealed the mine-run law, the headquarters of district No. 21, United Mine Workers of America, composed of Texas, Oklahoma, Arkansas, Kansas and Missouri, are to be removed from McAllister, Oklahoma, to Fort Smith, Arkansas.

FOREIGN NEWS

Odessa, Russia—The coal famine at present existing in Russia has had the effect of arousing the attention of the state administration to the possibility of vastly increasing the present insufficient output of Russian coal. To this end an expert commission of mining engineers and specialists has been appointed to study and report upon the whole question. It is believed that the Dombrovo coal field can increase its output 25% through improved systems of mining. It is thought that the Donetz basin collieries are also capable of a like improvement.

PERSONALS

James V. Coryell, a lawyer and coal expert, has been appointed receiver for J. K. Dimmick & Co., which firm failed recently in Philadelphia.

William Andrews, of Lansford, chief coal inspector for the Lehigh Coal and Navigation Co., has been appointed foreman of the company's yards, succeeding B. H. Stockett.

It is rumored that United States Senator Clarence W. Watson may be elected president of the Elkhorn Fuel Corporation, which was recently organized with a capitalization of $30,000,000.

Alexander Bennett, former division mine superintendent for the Delaware & Hudson Co., has been appointed to succeed John G. Hayes, as general superintendent of the People's Coal Co. He has assumed the duties of his new position.

John Hines was recently appointed superintendent of the Nay Aug Colliery at Dunmore and of the Mohawk Colliery at Carbondale. Mr. Hines has for several months past acted as foreman at the Nay Aug. mine.

A. F. Wolf, of Wilkes-Bare, has bought out the interests of the Central Coal Co., of Scranton in a property of ninety-seven acres of coal land in Plains township, near Hudson.

His intention is to erect a modern breaker and to start operations as soon as possible, probably within six months. Mr. Wolf is the head of the Wolf Coal Co., with offices at Freeland, and extensive operations at Lattimer.

Max G. Voelker, northern sales manager of the Skeele Coal Co. at Buffalo, has been appointed northern sales agent of the Youghiogheny & Ohio Coal Co. at the same place, to fill the vacancy caused by the promotion of H. L. Findlay to the position of general sales manager of the Y. & O., with headquarters at Cleveland. Mr. Voelker will be succeeded by Frank J. Honan, from the New York office of the Skeele Company.

TRADE CATALOGS

Sullivan Machinery Co., Chicago, Ill. Bulletin No. 58-O. Portable drilling rigs. Illustrated, 16 pages, 6x9 in.

Ingersoll-Rand Co., 11 Broadway, New York. Form 4017. "Butterfly" hand hammer drills. Illustrated, 8 pages, 6x9 in.

Electric Service Supplies Co., 17th and Cambria Sts., Philadelphia, Penn. Booklet. Garton-Daniels lightning arresters. Illustrated.

The Baldwin Locomotive Works, Philadelphia, Penn. Record No. 72. Mallett articulated locomotives. Illustrated, 44 pages, 6x9 in.

The Sullivan Machinery Co., Bulletin No. 66-G on hammer drills for various classes of mining construction work and 65-A on diamond prospecting core drills.

Wm. Johnson & Sons (Leeds), Ltd., Armley, Leeds, England. U. S. Enginering Co., 80 Wall St., New York, representatives. Catalog. Briquetting machinery. Illustrated, 16 pages, 7½x10 in.

The Link-Belt Co. have recently issued a new 48-page book illustrating and listing their line of steel chains. This book should be of interest to the trade and will be mailed free upon request.

The Economical Burning of Coal—The Valley Iron Works, Williamsport, Penn. 32 pp., 8½x11 in. Describes the construction and possibilities of Ajax grates, with notes on the economical burning of coal, the treatment required to efficiently burn various kinds of coal, the air supply, firing methods, etc.

The National Tube Co.—Bulletin No. 12. Under the headings of uniformity, chemical composition, physical properties, bursting strength, threading, improvements, full weight pipes, and spellarizing, this bulletin contains a vast amount of concise information about pipes which the average consumer wants to know.

The Ingersoll-Rand Co., 11 Broadway, New York City, has just issued a 40-page, 6x9-in. catalog, form 3008, covering their class "PE" duplex direct-connected electrically driven compressors. Among the principal features of design and construction are: The clearance controller, the hurrican inlet valve, auxiliary water separator, inclosed flood lubrication for main bearings, crank pins and cross heads, liberal wearing surfaces, maximum valve and port ares. The ctalog is illustrated and shows a table of sizes and capacities.

RECENT COAL AND COKE PATENTS

Miners Drill—W. Channon, Des Moines, Iowa. 1,055,608, March 11, 1913. Filed Sept. 13, 1911. Serial No. 649,189.

Mining Transit—W. A. Berger, Boston, Mass. 1,055,309, March 11, 1913. Filed April 30, 1908. Serial No. 430,054.

Cupola Furnace—P. Anderson, Arvika, Sweden. 1,054,381, Feb. 25, 1913. Filed August 11, 1911. Serial No. 644,338.

Mining Apparatus—I. N. Henness, Moclips, Wash. 1,054,410, Feb. 25, 1913. Filed July 18, 1910. Serial No. 572,542.

Rotary Steam Engine—J. Prosseda, Fredonia, N. Y. 1,054,612, Feb. 25, 1913. Filed Sept. 13, 1912. Serial No. 720,246.

Train Coaling Station—C. C. Brackett, Chicago, Ill. 1,054,272, Feb. 25, 1913. Filed Sept. 13, 1911. Serial No. 649,035.

Coal Screening Tower—G. E. Titcomb, Philadelphia, Penn. 1,056,472, March 18, 1913. Filed May 29, 1911. Serial No. 630,107.

Blast Furnace Charging Apparatus—J. W. Shook, Holt, Ala. 1,055,671, March 11, 1913. Filed May 14, 1912. Serial No. 697,196.

Check Holder for Mine Cars—O. E. Dickinson, Herminie, Penn. 1,054,513, Feb. 25, 1913. Filed July 23, 1912. Serial No. 711,122.

Conveyor—G. H. Mueller assignor t Jeffrey Mfg. Co., Columbus, O. 1,054,305, Feb. 25, 1913. Filed April 8, 1903. Serial No. 425,903.

Turbine—J. L. Moore assignor to Kerr Turbine Co. Wellsville, N. Y. 1,054,134, Feb. 25, 1913. Filed Dec. 17, 1912. Serial No. 737,292.

Safety Device for Cable Railways—R. H. Williams, Shamokin, Penn. 1,055,249, March 4, 1913. Filed Dec. 26, 1911. Serial No. 667,789.

Preparing Coke for Charging Blast Furnaces—M. C. Steese, Youngstown, O. 1,054,051, Feb. 25, 1913. Filed Feb. 24, 1911. Serial No. 610,653.

Apparatus for Drying Washed Coal and Other Material—C. Catlett, Staunton, Va. and D. Hancock, Birmingham, Ala. 1,056,738, March 18, 1913. Filed June 1, 1912. Serial No. 701,102.

Manual Coal and Rock Drilling Machine—Theo. Lippiett, D. Lippiett, T. Lippiett, S. Lippiett, B. Lippiett and W. Lippiett. Tredegar, Eng. 1,054,925, March 4, 1913. Filed Nov. 4, 1911. Serial No. 658,574.

CONSTRUCTION NEWS

Meyersdale, Penn.—The Boynton Coal Co. is sinking an air shaft in their mines just out of Meyersdale.

Shenandoah, Penn.—The contract for building the new Mammoth breaker of the Locust Mountain Coal Co. has been awarded.

Hauto, Penn.—Contractor Lewis Riebe, of Summit Hill, is erecting a new washery for the Lehigh Coal & Navigation Co., at Hauto.

Moundsville, W. Va.—Riggs Brothers have been awarded the contract for erecting a new tipple at the Hitchman Mine at Glendale.

William, W. Va.—The Roberts & Schaeffer Co., of Chicago, have closed a contract with the Western Maryland Ry. for a large Holmen coaling station for installation at William.

Mt. Pleasant, Penn.—The W. Harry Brown Coke Co. is arranging to erect several hundred coke ovens on the Weltner farm in Green County. The contract will be let and work started at once.

Gary, W. Va.—It is reported that the U. S. Coal & Coke Co. is making preparations for the erection of 200 houses around its various operations. It is said that the work will be begun at an early date.

Charlestown, W. Va.—It is reported that Barboursville is to be the terminal of the Guyan Valley branch of the Chesapeake & Ohio R.R. Work will soon be started on the construction of more than two miles of trackage. It is expected that the improvements will cost over $150,000.

Centralia, Ill.—The Roberts & Schaeffer Co., of Chicago, have just closed a contract with the Marion County Coal Co. for a new Marcus conveyor installation at Centralia. This new Marcus equipment, which this company has brought out during the past year, has met with much success.

Terre Haute, Ind.—The Clovelly Coal Co., H. B. Talley, President, is building a large modern shaft mine northwest of Terre Haute. The plant will have large capacity and will be entirely modern. An order has been placed with Crawford & McCrimmon Co., Brazil, Ind., for a large hoisting engine.

Youngstown, Ohio—Thos. MacDonald, district superintendent of the Carnegie Steel Mill, has returned from New York, where he attended a meeting of the U. S. Steel Corporation coke committee. It is the intention of the Carnegie company to commence next fall, the construction of coke ovens at MacDonald.

Pottsville, Penn.—The Philadelphia & Reading Coal & Iron Co. has awarded a contract for the sinking of a 700-ft. shaft to the Seven Foot Vein in the vicinity of Beechwood drift at Mt. Laffee. The contract calls for a three-compartment shaft, 7x12 ft. 8 in. These dimensions will be continued to a depth of 600 ft. It is possible that a new breaker will also be built at Mt. Laffee.

Scranton, Penn.—The Delaware & Hudson Co. will soon place a new breaker in operation in the southeastern part of Archbald. The breaker has been in the course of con-

struction for eight months and is now practically completed. All the adjoining buildings, such as fan houses, pumping houses, engine and boiler rooms, have been finished. The new slope which was driven about a year ago has been in operation some time. The new structure was built at a cost of about $300,000. The old White Oak breaker will not be abandoned, but the machinery will be removed and it will be used as a culm washery.

NEW INCORPORATIONS

Wytheville, Va.—The Wythe Mining Corporation; capital stock, $50,000.

Cleveland, Ohio—The Provident Coal Co. has increased its capital stock from $300,000 to $600,000.

Louisville, Ky.—The Tennessee Jellico Coal Co. is increasing its capital from $300,000 to $400,000.

Bristol, Va.—An amendment has been issued to the Mount Morgan Coal Co., decreasing the capital stock to $25,000.

Belleville, Ill.—The Southern Coal, Coke & Mining Co. Incorporators: W. K. Kavenaugh, J. Y. Lockwood and J. B. Kennard.

Pittsburgh, Penn.—The American Fuel Co.; capital stock, $10,000. Incorporators: E. F. McMillan, E. R. McMillan and T. R. Roberts, Jr.

Osceola Mills, Penn.—The Grace Coal Mining Co.; capital stock, $5000. Incorporators: S. B. Isenberg, G. W. Minns, E. C. Trees, Robert Wyatt and L. R. Somerville.

Punxsutawney, Penn.—The Brush Creek Coal Mining Co.; capital stock, $750,000. Incorporators: L. W. Robinson, B. M. Clark, F. H. Beck, J. W. Brown and Lewis Iselin.

Harlan, Ky.—The Martins Fork Coal Mining Co. has been organized with a capital of $20,000. The incorporators are W. F. A. Gregory, W. A. Brock, Geo. W. Creech, and H. M. Brock.

Frankfort, Ky.—The Butler County Coal Co., of Aberdeen, has been organized with a capital of $2000. The incorporators are J. A. Watkins, C. E. Sullivan, J. C. Haney and C. L. Drury.

Columbus, Ohio—The Maple-Gallia Coal Co. has been organized with a capital of $100,000. The incorporators are F. A. McManigal, W. J. Hamilton, A. Morse, M. L. Phelps, L. E. Ridgway.

Frankfort, Ky.—The Hobson Coal Co. has been incorporated with a capital of $30,000. The incorporators are A. Maben Hobson, S. Delaney, and W. R. Carter. The incurrence of debt is to be limited to $100,000.

Phoenix, Ariz.—A charter has been granted to the Tanaha Goldfield Mines Co.; capital, $10,000,000. Incorporators, M. O. Bicknell, Harry E. Jarman and Edgar McLaren, all of San Francisco, Calif., to mine gold, coal, etc.

Boston, Mass.—The Wakefield Coal Supply Co. has been organized with a capital of $35,000. The incorporators are Edward P. White, E. Horace Perley, Herbert M. Whitten, Albert R. Perkins, Daniel D. Peabody and Geo. H. Smith.

INDUSTRIAL NEWS

Pottsville, Penn.—It is reported that the Reading company is preparing to develop abandoned mines in the anthracite region.

Indiana, Penn.—R. W. Webrie, of Indiana, is the sole owner of about 1200 acres of coal land in Blacklick Township, and is making openings to mine the same.

Coal Creek, Tenn.—A 30-ft. coal seam is said to have been discovered on the property which lies between the Louisville & Nashville and the Southern railroads.

Birmingham, Ala.—The Tennessee Coal, Iron & R.R. Co. has made an appropriation of $100,000 with which to open a new coal mine near Blocton, in Bibb County.

Morgantown, W. Va.—Pitsburgh coal operators, who recently purchased large tracts of coal along Cheat River, are preparing to develop the same and openings are being made.

Lansford, Penn.—All the collieries in the Panther Creek Valley are closed on account of an oversupply of coal. The collieries have been working only a few days during the latter part of March.

Connellsville, Penn.—The Penn-Westmoreland Coal Co. has recently purchased 100 acres of 4-ft. coal near West Norton and will develop it at once. A. R. Byers, of New Stanton, is at the head of the company.

Cleveland, Ohio—Bankruptcy schedules filed in Federal Court by the Buckeye Clay & Coal Co., operating in Jefferson and Columbia Counties, show liabilities of $75,417, and assets of $83,395. I. E. Mathers is treasurer.

Morgantown, W. Va.—Holdings of the Kingwood Coal & Coke Co., situated on the West Virginia Northern and the Morgantown & Kingwood R.R., in the vicinity of Kingwood, have been sold to Cleveland capitalists, who will develop the same.

New Florence, Penn.—A big coal-land deal has just been closed in which the consideration is said to be over $20,000, and the land purchased lying between New Florence and Seward. It is believed that the Berwind-White Coal Co. is behind this deal.

Charlerol, Penn.—It is understood that negotiations have practically been closed for the purchase of the Pike mine of the People's Coal Co., at Brownsville, by the Vesta Coal Co. This mine, which opens into a tract of coal of between 1000 and 1200 acres, has not been in operation for about three years.

Pittsburgh, Penn.—The Buckeye Engine Co., of Salem, Ohio, have appointed the Federal Engineering Co., of Pittsburgh, Penn., as sales agents for the Pittsburgh district, to handle their full line of steam and gas engines and other products of their manufacture. This appointment takes effect Apr. 1, 1913.

Buffalo, N. Y.—Rumors persist that the Buffalo & Susquehanna railroad and mining interests are soon to be taken over by the Shawmut company, which is expected soon to be out of the hands of the receiver. Still it seems hardly probable that the Shawmut could swing the property without very material help from some source.

Uniontown, Penn.—Floods in the Middle West are responsible for the temporary shutdown in the coking industry. The H. C. Frick Coke Co. has announced that three-fourths of its ovens have been shut down for four days and independent companies have closed down for an indefinite period. Railroad companies are refusing to take shipments.

Birmingham, Ala.—The development work at the mines of the Maryland Coal Co.'s new operation is progressing rapidly, twenty drifts having been already opened. They will begin shipping coal about July 15 and will have the largest output of Black Creek coal of any mine in the State. About six miles of railroad is being constructed and a rich mineral district is opened up by it.

Bayview, Ala.—The opening of mine No. 16 of the Tennessee Coal, Iron & R.R. Co. is progressing rapidly. The company has been working for some time and has struck a fine bed of coal about a month sooner than was expected. Although no preparations had been made for mining the coal the company has started their men to work on a new opening in order that there may be no delay.

Steubenville, Ohio—It is understood that Chicago capitalists are about to purchase several thousand acres of No. 8 coal in the vicinity of Morristown, in Belmont County. If present plans do not miscarry, at least two mines will be opened on the property as soon as the sale is completed. It is believed that a further extension of the Belmont Central R.R. will be made in the direction of Morristown as soon as the sale is completed.

Bluefield, W. Va.—A new branch line of the Norfolk & Western is being constructed from Norwood up Laurel Hollow, a distance of four miles. It is the opinion of residents in that section that it will be but a short time before the road will be extended to Pineville. It is said that this extension will be made eventually with a view to tapping the coal deposits which are found in that section in large quantities.

Birmingham, Ala.—The Standard Steel Co. has recently purchased from the trustee in bankruptcy all the lands, works, merchandise, accounts and business of the Southern Iron & Steel Co., and have taken over the title to and possession of said property and business. The business of the purchased company will be conducted without the slightest interruption, and the various departments will be handled by the same staff of officials as heretofore.

Wheeling, W. Va.—The Richland Coal Co. has purchased the property of the Beech Bottom Coal Co., located south of Warwood. The sale was a conditional one, and the purchase price amounts to approximately $600,000. The property contains about 2500 acres of coal land, a modern mine and machinery, and a number of miners' houses. The new owners expect to increase the working force from 100 to 200 or 300 men. Bids will be received within a short time for the erection of 50 additional houses.

COAL TRADE REVIEWS

TRANSPORTATION CONDITIONS IN THE FLOOD ZONE

The most serious consequences of the recent flood, insofar as the coal industry is concerned, will be in the loss of tonnage due to the restricted transportation facilities and curtailment in demand, because of the general suspension of manufacturing in the affected area. At the moment, the transportation problem in the flooded zone is the controlling feature in the situation. While the trouble is being cleared up rapidly, there is still a considerable territory along the Ohio Valley, upon which reliable reports are wanting. In general, however, the situation is now fairly well in hand, and the conditions are about as follows:

New York Central & Hudson River R.R. and Subsidiary Lines—The New York Central reports all main lines open and conditions normal. On the branches, however, particularly down through the Miami Valley, in which are located Dayton and Piqua, there is still considerable uncertainty as to when traffic will be restored. Aside from a number of small landslides and washouts, which delayed traffic for not to exceed a few hours, the situation in Pennsylvania, except immediately in the Pittsburgh district, was at no time serious. Conditions at the latter point are normal and the main line open and working to Ashtabula on Lake Erie, so that consignments to the Lakes will not be interfered with. They report no congestion of any kind and, owing to the light traffic recently, expect to be able to handle everything offered without any trouble.

Pennsylvania Railroad—This company reports conditions as normal on their lines East of Pittsburgh. They concede trouble to the west in Ohio, but are not prepared at the moment to make any estimate of the extent. Western shipments were embargoed, most of last week, and production fell off to less than half capacity, but these embargoes were raised the first of the current week, and the shipments are now about 60 per cent. capacity. The first movement is, of course, being confined to flood sufferers, then to perishable freight, after which the coal consumers will be considered, and finally the Lake shipments. Fortunately, the traffic has been light over the past few weeks, and the roads generally are in an excellent position to recover rapidly from the high waters. One large coal company on the Pennsylvania lines reports no trouble of any kind at their operations, and this in spite of the fact that they are ordinarily subject to minor floods of all descriptions.

Norfolk & Western Railroad—This road reports the Eastern movement as normal in every respect, but with embargoes against everything North and West of the Ohio River. Their service across the river seems to be very seriously crippled, and indications are that Lake consignments will not be accepted for between one and two weeks.

Baltimore & Ohio Railroad—As in the case of the other roads, the Baltimore & Ohio reports the movement East as steady and normal in every respect. This road has declared no embargoes, and are accepting freight of all kinds, but with the understanding that it is subject to delay. It expects to have western connections completed at the end of the current week.

Chesapeake & Ohio Railroad—At noon on Tuesday of this week, the Chesapeake & Ohio succeeded in restoring its tidewater service, which had been out for several days. Their Western end is still under water, and the movement beyond Ashland, Ky., is restricted. Indications are that connections will be restored between Cincinnati and Chicago by the last of the current week. The Chesapeake & Ohio connections into Ohio over the Kanawha & Michigan Ry. at Point Pleasant, are all intact, and service would be normal except for trouble on the latter line, the extent, of which it is impossible to estimate at the moment.

GENERAL REVIEW

With the spring discount of 50c. per ton on all the domestic grades now in effect, the winter season on hard coal is technically closed. The summer trade opens with an unusual lack of activity. Ordinarily, there is a strong demand for April tonnages, since these are the lowest official prices of the year. Offerings at the spring circular have been freely made for some time, while many dealers still have some of their winter supplies, and the combination of these two conditions has resulted in rumors that the companies' circular will be liberally cut throughout the summer. Naturally, in the face of such conditions, buyers are hesitating to enter the market.

Many of the Eastern bituminous consumers are still holding off on contracts and do not appear to be uneasy over the outlook; shipments on the old agreements continue heavy, prices are not changed, and little interest is shown over the future. The Middle Western floods have not affected the Eastern situation in any way, as all the lines shipping those markets have experienced little or no trouble, and it is doubtful if anything short of a protracted and general suspension would be felt at the present time. As a matter of fact, the closing of shipments to the Northern and Western markets has resulted in these extra tonnages being thrown into the Eastern trade, creating a large surplus at several points.

Contracting has naturally increased, most of the old ones having expired on Tuesday of the current week. Some offerings ff of the regular circular are still being reported, but the trade as a whole is holding remarkably firm for advances all along the line, and it is evident that they will not in any event recede to the low level of last year. In the Pittsburgh district, on the outskirts of the flooded area, the market is rather unsettled, and rests entirely on transportation conditions.

There is practically no market in Ohio, and the trade is at a standstill, with the exception of a few odd tonnages of domestic coal for flood refugees. The coal movement in the state was probably never more completely paralyzed. The mines proper appear to have suffered comparatively little, from what information is available at the moment, and the greatest loss will be sustained by the falling off in tonnage. Many manufacturing concerns have been indefinitely crippled, and with the train service practically at a standstill, the consumption has dropped to little or nothing. Some of the Southern roads have issued embargoes on all shipments to the Lakes through Ohio, but it is expected that these will be raised before very long.

The railroad companies in the Middle West are in such poor condition that there is liable to be a serious shortage of steam coal. Contracting is not being very actively carried on, as buyers evidently prefer to pick up what they require in the spot market. There have been some heavy storms and snow, but these have not helped the situation much. There are rumors of an important coal consolidation among certain Illinois operators, which, if consummated, may establish a new condition in the Middle Western trade.

BOSTON, MASS.

Bituminous—The shippers argue variously on the outcome of the strike talk in the New River field. The general opinion is that the recognition granted in Kanawha County means that the New River operators must either concede this point now or face a strike that may be more or less serious. The prospect is rather in doubt. Meanwhile, the receipts at tide are ample and the agencies are still trying hard to place spot coal. Buyers decline to be scared into long purchases and shipments on old contracts continue to arrive in liberal amounts. Prices are unchanged and there is little interest shown in any of the Southern coals for future shipment.

It is understood that the largest producers of Georges Creek have marked prices up to a new high level; $2.95 is being talked now for a contract figure f.o.b. Baltimore. The impression seems to be that with the volume of business offshore and coastwise trade already in hand, the Georges Creek district is reasonably well supplied with orders.

The Clearfields show no change from a week ago. The heavy rains are being heard from and some of the operations are temporarily out of commission, but the market is dull and anything short of a general cessation will have little effect. Prices are weak and consumers are slow placing orders. In Somerset and Cambria counties there is a disposition to hold for prices at least 5c. higher than last year, and to curtail if the program is not realized.

Anthracite—April is is bound to be a disappointment to the producing companies. Spring prices have announced 50c. discount from the March circular on all sizes, but they had been so generally anticipated that little interest was shown.

The least quibble on the part of a transportation company as to towing or docking is enough to divert the order elsewhere. The outlook is that May will be a dull month, for New England will be fairly well stocked by the end of April.

Current wholesale quotations are about as follows:

Clearfields, f.o.b. mine	$1.00@ 1.35
Clearfields, f.o.b. Philadelphia	2.25@ 2.60
Clearfields, f.o.b. New York	2.55@ 2.90
Cambrias, Somersets, f.o.b. mines	1.25@ 1.50
Pocahontas, New River, f.o.b. Hampton Roads	2.60@ 2.80
Pocahontas, New River, on cars Boston	3.55@ 3.80
Pocahontas, New River, on cars Providence	3.35@ 3.65

NEW YORK

Bituminous—With many of the old contracts having expired and the new ones not renewed as yet, production for the current week will probably experience some falling off. However, consumers are showing a more active interest in contracts, and there has been considerable done in this line during the week. Furthermore, the operators generally are obtaining the substantial advances over last year's quotations, for which they have been so firmly holding out. Conditions during the week appear to have taken a turn for the better, and there is a good healthy demand which has placed the sellers in a strong position. As compared with last year at this time, the price level is about $1 lower at the moment, but such comparison is hardly fair because of the unsettled labor conditions prevailing at this time in April, 1912.

The movement into New York is fairly strong, and the spot market comparatively good. Because of the number of contracts which have not been renewed, there will probably be an increase in this business for the time being. Prices continue at the low point for the year so far, as follows: West Virginia steam, $2.55@2.60; fair grades, Pennsylvanias, $2.65@2.70; good grades of Pennsylvanias, $2.75@2.80; best Miller, Pennsylvania, $3.05@3.15; Georges Creek, $3.25@3.30.

Anthracite—The hard-coal mines were, in a great many instances, closed down between one and two days as a result of the flood. As all the companies were, however, working under a curtailed production, the matter was of no consequence. The anthracite movement, as a whole, has not been seriously interfered with by the high waters except for the comparatively small shipments to the West, where the flood conditions are more severe. Car supply has been in excess of requirements for several weeks, and as freight traffic has been generally light, there is little cause for the roads to become congested because of the recent trouble.

April business did not open up as strong as in previous years, and the consumers are apparently undecided about entering the market at the present time. A number have carried fairly large stocks over from the past winter, and there are rumors to the effect that April prices are liable to continue well into mid-summer, so there is not much inducement to stock heavily this early in the season. The larger companies are again working full time, and apparently expect to continue so indefinitely. Both steam and domestic grades are moving rather slowly, the only active demand being for pea.

No important change is noticeable in the New York market, with the exception of the automatic decrease of 50c. per ton on the prepared sizes, the market now being quotable as follows:

		Individual	
	Circular	Lehigh	Scranton
Broken	$4.50	4.45	4.50
Egg	4.75	$4.50 @ 4.70	$4.50 @ 4.75
Stove	4.75	4.70	4.75
Chestnut	5.00	4.70 @ 4.95	4.75 @ 4.90
Pea	3.50	3.25 @ 3.45	3.25 @ 3.50
Buckwheat	2.75	2.10 @ 2.45	2.40 @ 2.25
Rice	2.25	1.90 @ 1.95	2.75
Barley	1.75	1.20 @ 1.50	1.55 @ 1.75

PHILADELPHIA, PENN.

To all intents and purposes the winter season in the coal trade is over, and the past week marks the first of the new coal year. Mining has again been resumed on an all week basis, and the tonnage is moving off well, but there seems to be a marked apathetic attitude by the trade. Reports from all sides indicate an unusual indifference at the inception of the coal year. Perhaps this may be due to the fact that many dealers carried over considerable coal, owing to the unseasonable weather that has prevailed; another factor which is determining the policy of many dealers, and causing them to lay in supplies as economically as possible, is that prices in the summer will probably be even less than they are at present because of price cutting by the individual operators. It is current gossip in the trade that even April prices are shaded, and offers have been made of a straight price all through the summer up to Sept. 1, which would net even less than the company's prices in this vicinity. It is these rumors that are keeping the dealers from tieing up money in coal now, when they possibly may be able to secure all the tonnage they want in midsummer at even less than they are paying now. This is the proposition that is keeping many of them wondering what is best to do.

The individual operators are not having an easy time in disposing of their product, and it is only by making concessions such that consumers cannot well turn down, that they are doing any business at all. Everything being equal, the dealer who was not held up for heavy premiums, is going to place his business where he was fairly treated during the past winter, but a saving of $10 to $15 a car is likely to cause many of the trade to swallow their resentment. At any rate, the month of April is likely to show good business, both from a wholesale as well as retail standpoint, but as has been indicated, it is the result of the number of units, rather than the volume of tonnage requirements.

In the bituminous trade, they are still playing a waiting game. An increased price on contracts is being asked but consumers feel that they will not be justified in paying the advance. It is understood that some contracts are being signed up, but many orders are still being held, with the hope that lower prices will prevail.

PITTSBURGH, PENN.

Bituminous—The Pittsburgh coal district was affected by last week's floods only in the matter of transportation, although some Pittsburgh interests have mines in Ohio which were closed by the high water. Tuesday and Wednesday of last week coal shipments from Pittsburgh to the West were entirely suspended, railroads embargoing all coal and coke. On Saturday night the Pittsburgh & Lake Erie began accepting shipments again for all points on its lines, including Connellsville coke for Chicago. Sunday the Pennsylvania had everything open to Lake Erie points, also the Fort Wayne line as far as Orrville and the Pan Handle as far as Dennison, with prospects that it would be nearly the close of the week before transportation could be resumed to points farther west.

The Pittsburgh district fell to operating less than half capacity toward the close of last week, but is opening the new week with operations at nearly half capacity, and the week will probably close with above 50 per cent., and perhaps above 60 per cent. Full shipments are not possible, even where lines are opened up, as there is a marked shortage of empties. As a rule the railroads are refusing to accept coal destined for the Lake trade, holding that supplies for flood sufferers should be cleared up first, then perishable freight, and then coal for consumers, before lake coal is moved. However, there is reason to believe that a little lake coal is being moved.

Many consumers west of Pittsburgh are suffering badly from lack of coal, but there is not much demand market-wise since it is simply transportation that is involved. Coal operators are not undertaking to arrange for delivery, in offering coal, and purchases of prompt coal being made are simply f.o.b. mine, and at regular prices, the buyer looking after the movement. We note one sale of this sort, where the buyer (in the west) took 25 cars and hoped to have a train made up which could be moved expeditiously.

Apr. 1 marks the beginning of a new year, on many coal contracts. Not all expiring contracts have been renewed, the slowness of buyers being attributed to the higher prices this season, but the leading operators have been adhering to these prices quite well and report that they have lost little business on account of cut prices by small operators. We continue to quote: Slack, 90c.; nut and slack, $1.05; nut, $1.25; mine-run, $1.30; ¾-in., $1.40; 1¼-in., $1.55, per ton at mine, Pittsburgh district.

Connellsville Coke—The floods last week stopped practically all coke shipments to the West, or about one-half the total normal movement out of the region. As already noted, railroad movement is being resumed. A large tonnage of coke has accumulated in the region, little effort being made to curtail production, by the merchant operators. The H. C. Frick Coke Co. banked many ovens, practically in proportion to the steel corporation furnaces which had to be banked. There is little wire communication with Western points affected, and the condition of blast furnaces is not fully known, but reports gathered by one of the railroads are to the effect that eight furnaces have chilled, and will therefore have to be shoveled out, requiring two to three weeks, and perhaps relined, involving more than double the time. Other furnaces affected are resuming as the water goes down.

The coke market has been entirely upset, and fresh prices will have to be developed as demand appears. At the moment there is no demand at all, while some operators are offering prompt coke and would naturally take low prices. It is out

of the question to mention prices at this time which would be at all informative, and even a week hence a market may not be clearly established.

BALTIMORE, MD.

Interest here, at the moment, is centered in the floods in Ohio and adjoining states during the past week, which practically brought Lake shipments to a standstill on the Baltimore & Ohio and other roads. Large tonnages had started to move to Loraine and Cleveland on Mar. 20, and other operators were preparing to forward cargoes, when the roads notified shippers that they would be unable to handle fuel traffic to the West and Northwest. During the latter part of the week the Baltimore & Ohio was closed, West of Parkersburg and Wheeling, and its Cleveland, Loraine & Wheeling line, over which most of the Lake coal traffic is carried, was also put out of commission. Such shipments accumulated rapidly during the week.

BUFFALO, N. Y.

It is claimed by bituminous jobbers that prices are firmer than they were a week ago, as the leading operators, especially in the Pittsburgh district, are holding firm on their season's quotations. While it is conceded that there is more or less coal offered at reduced prices, the trade as a whole is refusing to consider such business and is determined not to recede to the low level of last summer.

The beginning of shipments to the Lakes always disturbs the bituminous market, especially as it develops a surplus of slack. In addition to this the floods have practically shut down the mines and absolutely held up the movement in many cases.

Bituminous quotations remain at $2.80 for Pittsburgh lump; $2.65 for three-quarter, $2.55 for mine-run and $2.15 for slack, with Allegheny Valley 25 to 30c. lower. Coke is steady on the basis of $5 for best Connellsville foundry. There is next to no demand for anthracite, though the April price will revive it.

The drop in prices has been more pronounced in the East than it has here; all quotations appear firmer towards the West. The great scarcity of anthracite Westward no doubt has something to do with that. Flood conditions will tend to make that still scarcer in the West and as it now appears there will not be much relief possible till the lakes are open. There is a large amount of both sorts of coal going afloat and it may begin to move very soon. Buffalo ships only anthracite by lake, having about 125,000 tons afloat now, with all shipping docks active; tonnage is plentiful.

CHICAGO

It is estimated that half of the domestic supply and 25% of the steam production has been shut out of the Chicago market because of the floods in Ohio and Indiana. As a result, prices here are increasing. Cold weather has also stimulated the demand. Almost half the mines which supply domestic coal to this market are now unable to ship. Chicago is dependent, at present, upon the mines of the northern central part of Indiana and the more northerly operations in Illinois. There are but a few of the Indiana producers able to get their coal into this market. Companies in a position to make shipments here are able to get fancy prices, about on a level with those obtained for the better grades of Illinois coal. The coke market remains steady as a result of a curtailment in supply. New circular prices on byproduct coke place the price of that commodity at $4.45 for April delivery.

Prevailing prices in Chicago are:

	Sullivan Co.	Springfield	Clinton	W. Va.
Domestic lump	$2.47	$2.07	$2.27	.....
Egg	2.47	.....	.....	$3.95
Steam lump	$2.12 @ 2.37	1.92 @ 1.97	2.17	.....
Mine-run	.....	1.87 @ 1.92	1.97	3.30
Screenings	1.67 @ 1.72	1.57 @ 1.62	1.67	.....

Prevailing prices for coke are: Connellsville and Wise County, $6@6.25; byproduct, egg, stove and nut, $4.45; gas house, $4.75@4.85.

COLUMBUS, OHIO

The heavy floods of last week completely demoralized the coal trade in this state. Railroads are paralyzed, and in fact work of all kinds was suspended after Tuesday, when the worst of the flood occurred. As a result of the high waters communication with almost every section of the state was cut off and it has been impossible to estimate the damage.

Generally speaking the greatest loss will result from the stoppage of work and the fact that many large consumers were put out of commission, temporarily at least. Only a few of the mines of the state were flooded and the damage from that source will not be large. Some of the tipples at the mines of the Sunday Creek, New York Coal Co. and the New Pittsburgh Coal Co. were badly damaged, entailing some loss.

There was a rush of small domestic orders during the latter part of the week because of the flood necessities, the colder weather after the waters subsided making is uncomfortable for the refugees. This demand is only temporary and will fall off just as soon as the homeless people have been housed.

Steam tonnage is not so much in demand because many of the factories were put out of commission. Some of the electric light plants bought more heavily but this does not counteract the falling off in tonnage from other sources. There was not quite so good a demand for railroad fuel, due to the small train movement. Thousands of bridges in Ohio are out and it will be some time before repairs are made and the movement again normal.

Preparations had been made for an active Lake trade but the high waters have made shipments impossible for the time being. Considerable coal has been loaded on boats, however, and this will be moved as soon as navigation opens.

In eastern Ohio a number of the mines were flooded and some damage is reported although it is a little early to estimate its extent. In the Pomeroy Bend field some of the mines were out of commission but most of them were on higher ground and will be worked just as soon as the railroads are able to move the coal. Prices along the list were held at the same level as the previous week.

Quotations in the Ohio fields are as follows:

	Hocking	Pittsburgh	Pomeroy	Kanawha
Domestic lump	$1.45	.....	$1.50	$1.40
¾-inch	1.35	$1.20	1.35	1.30
Nut	1.30	.....	1.30	.....
Mine-run	1.15	1.10	1.15	1.10
Nut, pea and slack	0.80	.....	0.75	0.80
Coarse slack	0.70	0.80	0.65	0.70

BIRMINGHAM, ALA.

The continued cold weather is a relief to many of the dealers who were fearful that they were not going to be able to clean up their yards. Considerable trouble is being experienced by some of the local mines on account of too much water and the production at many is below normal at the present time. The recent storms damaged the surface plants of a few of the mines and production was thus further reduced by this cause.

Smithing coal is very scarce, none of the producers of this grade of coal being able to promise anything like prompt shipment. There has been no material change in the coke market, the demand for high-grade foundry product continuing to be good.

LOUISVILLE, KY.

The railroads have been so hampered by washouts and weakened bridges that the movement of all kinds of traffic has been seriously interfered with. The Louisville & Nashville and the Chesapeake & Ohio, in the eastern field, and the Illinois Central and the Louisville, Henderson & St. Louis, in the western, have all had their troubles in getting out coal, although the latter is in the best condition of any. While the water is still high, and will probably recede slowly, the railroads in Kentucky are rapidly recovering, and conditions will probably be approximately normal by the end of the week.

Prices are from $1.75 to $1.85 on Jellico and Straight Creek, with block and lump selling at $1.60 and $1.75, and round at $1.25 to $1.40. Second-class coals are being offered to the trade at $1.50 to $1.60 for block, $1.35 to $1.50 for block and lump, and $1.10 to $1.15 for round. Straight run-of-mines is available at $1 to $1.10 for the better grade, and 90c. to $1 for No. 2. There is a keen demand for nut and slack as high as $1, with Western Kentucky nearly as high, in some cases, although some straight mine-run has sold at 80 cents.

ST. LOUIS, MO.

The heaviest snow of the winter came the middle of the past week, but it did not help the market. Coal is still dragging and there is nothing out of the ordinary from reports of the past two or three weeks.

There has been some little encouragement to the retail coal man, inasmuch as there was a good demand for very small lots of coal, but on the whole this did not affect the shipping market in the least. As a matter of fact, if anything, it created a disturbance that brought prices lower than they have been thus far this season, and especially was this so on the better grade coals.

Overproduction still continues, but there is hope now that conditions will improve, inasmuch as some of the operators are in a movement to suspend operations for the next three or four months. Washed coals are in fairly good demand,

and from this time on these grades will continue to get better.

The prevailing circular is:

	Carterville and Franklin Co.	Big Muddy	Mt. Olive	Standard
2-in. lump	.....	.....	.....	$0.90
3-in. lump	.....	.....	$1.25	.....
6-in. lump	$1.20 @ 1.25	.....	1.35	1.10
Lump and egg	1.25	$2.25	.....	.....
No. 1 nut	1.10 @ 1.15	.....	.....	.....
Screenings	0.90 @ 0.95	.....	.....	0.65
Mine-run	1.05 @ 1.15	.....	.....	0.85
No. 1 washed nut	1.40 @ 1.50	.....	.....	.....
No. 2 washed nut	1.35 @ 1.45	.....	.....	.....
No. 3 washed nut	1.25 @ 1.30	.....	.....	.....
No. 4 washed nut	1.15 @ 1.20	.....	.....	.....
No. 5 washed nut	1.00 @ 1.05	.....	.....	.....

MINNEAPOLIS—ST. PAUL

Wholesalers representing Illinois coals, report business dull with prices inclined to be rather weak. Carterville district coal is selling for $1.15 to $1.25, and Franklin County lump is quoted from $1.25 to $1.40. Dock circular prices, quoted Apr. 1, are as follows: Youghiogheny, Hocking and Splint lump, $3.55; Hocking screenings, $2.30; Youghiogheny and Splint screenings, $2.25; Splint and Youghiogheny dock run, $3.25; Hocking dock-run, $3.15; Smokeless lump or egg, $4.75; Smokeless lump and egg, $4.50; Smokeless mine-run, $3.50; Smokeless screenings, $2.90. The above prices are 15c. above the opening prices at this time last year.

OGDEN, UTAH

The storms which have visited the inter-mountain territory during the past 10 days have stimulated the demand for coal. This was noticed first about Mar. 24, when urgent demands were made for immediate shipment of both lump and nut. The movement of coal into the Nebraska and Kansas territory picked up slightly and no doubt will continue to do so until it is again normal. Naturally the summer prices, effective Apr. 1, have had a tendency to curtal shipments during the last of March owing to the reduction of 50c. per ton on lump coal, f.o.b. mines.

Quotations on Wyoming coal for shipments to Nebraska and Kansas are: Lump, $2.25; egg, $2; nut, $1.75; mine-run, $1.75; slack, $1. For shipment to the Northwest from Wyoming and Utah: Lump, $2.75; nut, $2.25; mine-run, $1.85; Wyoming slack, $1; with Utah slack, $1.25.

PORTLAND, ORE.

The weather in the Pacific Northwest the past week has been conducive to a good cleanup of coal stocks. Indications and records are to the effect that the cool spell cannot well be expected to continue longer, milder weather having already been noticed in the vicinity of the coast. Prices have shown no fluctuation since last fall when winter quotations were put into effect.

What effect the opening of the Panama Canal is going to have on the fuel situation in the Pacific Northwest, is one on which there is much speculation. That there is ample room for lower prices and that such would tend to increase the consumption is the general belief of the buyers, if not of the dealers.

PRODUCTION AND TRANSPORTATION STATISTICS

VIRGINIAN RAILWAY

Total shipments of coal over this road for February of the current year were 399,267 tons as compared with 294,041 tons for the same month last year. Shipments for the first two months of the year were: 853,153 tons for the current period and 611,446 tons in last year.

IMPORTS AND EXPORTS

The following is a comparative preliminary statement of imports and exports for February and last 8 months in long tons.

	8 Months			February	
Imports—	1911	1912	1913	1912	1913
Anthracite	.....	2,184	1,645	15	.....
Bituminous	1,345,447	789,246	1,114,209	118,921	134,269
Coke	122,535	38,663	79,921	5,241	4,084
Exports—					
Anthracite	1,911,812	2,301,177	3,224,604	231,684	361,493
Bituminous	7,714,369	9,664,216	9,923,966	695,655	896,790
Coke	615,230	514,421	566,403	59,536	74,541
Bunker Coal	4,189,020	4,453,131	4,794,912	530,272	564,222

OHIO COAL TRAFFIC STATEMENT

The following is a comparison of the coal shipped over the different Ohio roads during the past three years in short tons:

Railroads	1910	1911	1912
Hocking Valley	4,777,478	3,621,794	4,172,908
Toledo & Ohio Central	2,186,435	1,902,304	1,965,893
Baltimore & Ohio	2,455,473	1,828,320	4,283,998
Cleveland, Lorraine & Wheeling	3,053,998	3,018,267	3,368,863
Zanesville & Western	1,245,103	1,151,434	1,208,628
Toledo Division (Pennsylvanie Co.)	2,331,160	1,942,145	6,603,773
Lake Rrie, Alliance & Weheling	1,328,594	1,256,636	1,103,177
Marietta, Columbus & Cleveland Ry	94,101	30.131	36,707
Wabash, Pittsburgh Terminal Ry	63,291	53,920	183,440
Kanawha & Michigan Ry	.....	121,682	183,440
Detroit, Toledo & Ironton	.....	.....	255,427
Total	21,307,370	18,601,509	25,828,745

THE CAR SITUATION

American Ry. Association reports surpluses and shortages of coal equipment for two weeks ended Mar. 15, as follows:

	Surplus	Shortage	Net*
New England Lines	79	0	**79**
N. Y.; New Jersey, Del.; Maryland; Eastern Penn	3,279	1654	**1,625**
Ohio; Indiana; Michigan; Western Pennsylvania	3,434	260	**3,174**
West Virginia, Virginia, North & South Carolina	1,004	462	**542**
Kentucky, Tenn.; Miss.; Alabama, Georgia, Florida	683	835	152
Iowa, Illinois, Wis., Minn.; North & South Dakota	2,099	496	**1,603**
Montana, Wyoming, Nebraska	764	40	**724**
Kansas, Colorado, Missouri, Arkansas, Oklahoma	3,026	0	**3,026**
Texas, Louisiana, New Mexico	438	6	**432**
Oregon, Idaho, California, Arizona	3,061	23	**3,038**
Totals	17,867	3776	**14,091**
Greatest surplus in 1912 (Apr. 25)	94,692	2,144	**92,548**
Greatest shortage in 1912 (Oct. 10)	6,491	14,897	**8,406**

*Bold face type indicate a surplus.

BALTIMORE & OHIO R.R.

The following is a comparative statement of the coal and coke movement over this road for February and the first two months of this year and last year:

	February		2 Months	
	1913	1912	1913	1912
Coal	2,550,417	2,695,874	5,553,821	5,139,402
Coke	371,355	366,777	810,531	696,333
Total	2,921,772	3,062,651	6,364,352	5,835,735

FOREIGN MARKETS

GREAT BRITAIN

Mar. 19—With the near approach of the holidays, business is of a quiet character. Sellers are firm in their ideas of prices for April loading.

Quotations are approximately as follow:

Best Welsh steam	$4.62@4.74	Best Monmouthshires	$4.20@4.26
Best seconds	4.50@4.62	Seconds	4.08@4.14
Seconds	4.38@4.44	Best Cardiff smalls	3.78@3.84
Best dry coals	4.44@4.50	Seconds	3.54@3.60

The prices for Cardiff coals are f.o.b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f.o.b. Newport; both exclusive of wharfage, and for cash in 30 days—less 2½%.

British Exports—The following is a comparative statement of British exports for February, and the first two months of the last three years in long tons:

	February		2 Months		
	1911	1913	1911	1912	1913
Anthracite	205,275	187,057	430,564	447,199	485,365
Steam	3,996,361	4,046,314	7,126,219	7,941,579	8,46,307
Gas	903,273	875,335	1,548,601	1,730,471	1,776,699
Household	125,224	147,861	247,708	264,903	293,587
Other sorts	284,911	313,350	489,552	552,007	620,277
Total	5,514,984	5,569,917	9,842,644	10,936,159	11,640,235
Coke	108,169	98,755	169,873	222,040	205,850
Manufactured fuel	161,251	154,253	284,884	310,183	350,992
Grand total	5,784,404	5,822,925	10,297,401	11,468,382	12,197,077
Bunker coal	1,550,319	1,539,410		3,066,978	3,297,089

GERMAN EMPIRE

The following are the German imports and exports for the years 1911 and 1912:

	Imports		Exports	
	1911	1912	1911	1912
Coal	10,913,948	10,380,482	27,046,193	31,143,115
Lignite	7,069,064	7,266,116	58,071	56,965
Coke	598,958	589,713	4,559,975	5,849,020
Coal Briquettes	94,822	52,562	1,958,826	2,119,541
Lignite Briquettes	116,111	135,714	518,666	726,995

FINANCIAL DEPARTMENT

Lehigh Coal & Navigation Co.

The following is summary of President Warriner's report for the year ended Dec. 31, 1912:

The decrease in commercial production during the year is accounted for mainly by the suspension of mining during the month of April and part of May, pending the conclusion of negotiations between the operators and the United Mine Workers of America. Production was further curtailed by interruptions at several collieries which occurred in the month of September and lasted for a period of nineteen days, due to trouble among the men over the question of union membership. The decrease in production was general throughout the anthracite trade in 1912, as the official statistics show that the total shipments of anthracite during the year amounted to 63,610,578 tons, a decrease of 6,343,721 tons as compared with 1911. The cost of mining increased on account of increased maintenance charges during the suspensions of work above referred to, as well as on account of increased wages and cost of supplies.

Market conditions were satisfactory during the year, excepting for the company's inability at times to supply the demand for its coal, a condition resulting from the suspension above referred to. This inability to meet the demand is now almost overcome, and it is expected that within a short period the production will be able to fill every demand. The company sold its entire production during the year as well as its supply of stock coal. The tonnage sold was 3,646,431 gross tons, an increase of 58,967 tons compared with the previous year.

During the past year the company expended for additions and betterments the sum of $649,743, and charged off for depreciation, and abandonment on account of obsolescence, $522,667.

During the year an exhaustive investigation was made into the operating and accounting methods of the company and in accordance with the advice of certified accountants, your board are agreed on the wisdom of a policy of accounting under which there shall be established proper reserves for coal lands depletion, depreciation of improvements, insurance, mining hazards and similar items entering into mining costs; and have, beginning with the current year, in accordance with this plan, transferred the securities and cash in the coal lands sinking fund and the insurance fund into the general funds of the company, under appropriate accounts establishing the proper reserves, which will appear in the balance sheet for the year 1913.

The gross revenue from all sources for the year amounted to $13,862,437, an increase of $128,659. Expenses increased $453,572.

The tonnage of commercial coal mined by the Lehigh Coal & Navigation Co. and by the Alliance Coal Mining Co., and the tenants of these companies, during the past four years (in gross tons) compares as follows:

Mined by:	1912	1911	1910	1909
Company	3,275,585	3,615,141	3,375,541	2,828,788
Lessees	181,505	215,887	285,822	224,927
Alliance	88,067	39,645	.....	.....
Lessee of Alliance	71,776	130,334	188,492	134,264
Total	3,616,933	4,001,007	3,849,855	3,187,979

Northern Securities Co.

President Jas. J. Hill, of this company, states under date, Jan. 10, 1913:

Checks are herewith transmitted for a dividend of 2% on the stock declared payable on this date.

For the year ending Dec. 31, 1911, the company received one dividend of 1% upon its holding stock in the Crow's Nest Pass Coal Co., but during 1912 no dividend was received from this source. The Coal company resumed operations about Nov. 1, 1911, following a prolonged strike. We are informed that the business of the Coal company has been satisfactory during 1912, but that it has been the policy of its directors to apply the net earnings to the reduction of the floating debt. That the debt at the end of the year 1911, amounted to about $1,374,000 (as against their paid-up capital stock of about $6,213,000), and we are informed that at the end of 1912 it had been reduced to about $900,000.

The by-laws of the Northern Securities Co. have been amended and the number of directors of the company reduced from fifteen to six.

RESULTS FOR CALENDAR YEARS

	1912	1911	1910
Divs. from C. B. & Q. R.R. (reg. (8%)	$119,704	$119,704	$119,704
Divs. Crow's Nest Pass C. Co.,Ltd.	.....	(1%)27,552	(2%)55,104
Interest	34	40	40
Total receipts	$119,738	$147,296	$174,848
Deduct—Taxes	$3,477	3,679	3,512
Administration expenses	15,521	20,609	20,952
Interest on loans	5,615	5,438	5,427
Dividends	(2%)79,058	(3%)118,590	(4%)158,116
Total deductions	$103,671	$148,316	$188,007
Balance	sur.$61,067	def. $1,020	def.$13,159

BALANCE SHEET DEC. 31

Credits—	1912	1911
Organization exp.	$85,048	$85,048
Investments	*a* 6,599,954	6,600,949
Cash	61,585	99,091
Debits—		
Capital stock	$3,954,000	$3,954,000
Bills payable	160,000	175,000
Surplus	*b*2,632,587	2,656,088
Total	$6,746,587	$6,785,088

a The item of investments includes in 1912 14,963 shares Chic. Bur. & Quinye R.R., valued at $2,858,688; 26,552 shares Crow's Nest Pass Coal Co., Ltd. $3,741,166.

b Before deducting 2% dividend paid Jan. 10, 1913.

COAL SECURITIES

The following table gives the range of various active coal securities and dividends paid during the week ending March 29:

Stocks	Week's Range—High	Week's Range—Low	Week's Range—Last	Year's Range—High	Year's Range—Low
American Coal Products	90	90	90	87	87
American Coal Products Pref.	109½	109½	109½	109½	109½
Colorado Fuel & Iron	35½	33¾	35½	41½	31
Colorado Fuel & Iron Pref.	....	....	155	155	150
Consolidation Coal of Maryland	102¼	102¼	102¼	102¼	102¼
Island Creek Coal Pref.	86	85	85	.. ..	.. ..
Lehigh Valley Coal Sales	240	204	204	. .	. .
Pittsburgh Coal	19¾	19	19½	24⅜	19
Pittsburgh Coal Pref.	85	82½	85	95	80¼
Pond Creek	23½	22	23½	28¼	22
Reading	161⅝	155¼	161⅜	168¼	152½
Reading 1st Pref	91	90½	91	91½	89½
Reading 2nd Pref.	90	89½	90	93	87½
Virginia Iron, Coal & Coke	50	50	50	54	44¼

Bonds	Closing Bid	Closing Asked	Week's Range or Last Sale		Year's Range	
Colo. F. & I gen. s.f.g 5s	97½	99	98	98	98	99¼
Colo. F & I. gen. 6s	..	..	107½	June '12	..	..
Col. Ind. 1st & coll. 5s. gu	78¾	Sale	78½	79	78½	85
Cons. Ind. Coal Me. 1st 5s	....	....	85	June '11	..	..
Cons. Coal 1st and ref. 5s	....	94	93	Oct. '12	....	....
Gr. Riv. Coal & C. 1st g 6s	96	102½	102½	Apr. 06	..	..
K. & H. C. & C. 1st s f g 5s	..	....	98	Jan '13	98	98
Pocah. Con. Coll. 1st s f 5s	85	87	87½	Mar. 13	87½	87½
St. L. Rky. Mt. & Pac. 1st 5s.	77	78	76	Mar. '13	76	80
Tenn. Coal gen. 5s	100	102½	100¾	Mar. '13	100¾	103
Birm. Div. 1st consol. 6s	..	103½	101½	101¼	101½	103
Tenn. Div. 1st g 6s	....	103½	102	Feb. '13	102	102
Cah. C. M. Co. 1st g 6s	....	....	110	Jan. 09	....	....
Utah Fuel 1st g 5s	....	....	....	....	....	....
Victor Fuel 1st s f 5s	80	84	79½	Feb '13	79½	79½
Va. I Coal & Coke 1st g 5s	94	97½	94½	Mar. '13	94½	98

Burns Brothers—Regular quarterly of 1¾% payable Apr. 1, to holders of record Mar. 20.

Lehigh Valley Coal Sales Co.—Regular quarterly of $1.25 payable Apr. 21, to holders of record Apr. 10.

Delaware, Lackawanna & Western Coal Co.—Regular quarterly 2½% and an extra of 20% payable Apr. 15, to holders of record Apr. 1.

Pocahontas Consolidated Collieries—Regular dividend of 2% and an extra of 1% payable Mar. 31, to holders of record Mar. 25.